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ACTIVITIES OF THE UNITED NATIONS SYSTEM: ACTIVITIES OF THE DEPARTMENT OF ECONOMIC AND SOCIAL DEVELOPMENT IN SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

Report of the Meeting of High-level Experts on Science and Technology for Development

SUMMARY

The present report is submitted in accordance with the draft provisional agenda for the first session of the Commission on Science and Technology for Development, as approved by the Economic and Social Council in its resolution 1992/62. Note should be taken, however, of the fact that the Meeting of High-level Experts on Science and Technology for Development, held in Bujumbura, Burundi, from 4 to 8 May 1992, took place in the context of the activity of the Advisory Committee on Science and Technology for Development, before this body, together with the Intergovernmental Committee on Science and Technology for Development, was transformed into the new Commission on Science and Technology for Development.

It is the view of the United Nations Secretariat that this report should be considered in the evolving context that led to the transformation of the Advisory Committee and the Intergovernmental Committee into the new Commission. Hence, the Commission, while acknowledging the relevance of past experience, might wish to develop innovative approaches that extend beyond those contained in the present report.

Fourteen high-level experts and five representatives from organizations and agencies of the United Nations system participated in the Meeting of High-level Experts on Science and Technology for Development.

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The discussions reflected the conviction of the participants regarding the important role played by science and technology as a dynamic resource for sustaining social and economic development.

The substantive theme was the role of science and technology in the development of the least developed countries. The Government of Burundi prepared a case-study of the country's experiences and members of the former Advisory Committee on Science and Technology for Development subsequently visited the country to undertake a critical assessment of its science and technology system. Earlier, an ad hoc panel of experts on the subject provided an overview of key policy issues on science and technology for the least developed countries. These activities, together with the interaction that took place with the representatives of the stakeholders of Burundi, served as a basis for formulating the recommendations contained in this report.

The Meeting's participants also discussed the role of technological cooperation in fostering regional economic integration. Some private sector initiatives were also considered.

Another topic addressed was the transformation of publicly funded industrial research and development institutions. The Meeting provided some novel approaches to this issue.

Finally, the participants in the Meeting reviewed the strengths and weaknesses of the work of the former Advisory Committee on Science and Technology for Development, and made recommendations related to the functioning of the new Commission on Science and Technology for Development. This was in response to General Assembly resolution 46/235, annex, in which it was stated that, in connection with the question of funding arrangements and the modalities for the convening of ad hoc panels/workshops, the new Commission could consider the practice of the former Advisory Committee.

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I. SCIENCE AND TECHNOLOGY FOR THE LEAST DEVELOPED COUNTRIES

A. Overview

1. The debate on the issue of science and technology for the least developed countries reflected the need for a new approach to policy in that area, in line with the changing global context and the new understanding of endogenous capacity in science and technology for development. This new approach should address all aspects of science and technology policy, including those of technology application, development and transfer, that had previously been neglected or underemphasized. Specific areas of weakness were addressed by the four main initiatives recommended at the national and international policy levels. It was noted that a specific strategy for building science and technology capacity and international competitiveness should be based on a case-by-case approach taking into account both the special needs and advantages of a particular country.

2. It was stressed that in the 1990s, the problems of the poorest countries had come to the forefront and needed to be urgently addressed.

B. General prerequisites

3. The Meeting of High-level Experts on Science and Technology for Development pointed to certain essential long-term prerequisites that were needed in order to secure an effective science and technology policy:

(a) There must be a minimum ongoing investment in the build-up and cultivation of human resources. As education required a long lead-time to become effective, an overall educational system must be put in place as an integral part of the cultural and societal structures;

(b) A science and technology policy for any given country would be meaningful only if it was based on a political consensus about the objectives and goals of development. Such a consensus must be reached in terms of an understanding of the relationships among social and cultural values, human capabilities and the possible utilization of existing material and intellectual resources;

(c) Owing to the broadening of marketing opportunities, and an unprecedented development of transportation, communication and information systems, entrepreneurship was evolving as a key factor in development. The educational system should favour and encourage creative thinking and the spirit of entrepreneurship. Entrepreneurship should be highly valued in society, and that could be achieved, inter alia, by giving entrepreneurs appropriate economic and fiscal incentives;

(d) In mobilizing individual creativity, the limits to be imposed by planning compared with freedom for action must be carefully balanced. Depending on the status of economic development in a given country, science and technology policy and development plans should determine the degree of government policy intervention versus the degree of freedom needed in the private sector;

(e) (Finally), any development plan should take into account the fact that success was a moving target. Therefore, a periodic reconsideration of evolving economic and other conditions was called for in order to achieve a continuous adjustment of plans and objectives.

C. Recommendations

1. Management of resources and building of endogenous capacities

4. Science and technology policy in the least developed countries needs to place greater focus on the development and utilization of locally available resources. Donor programmes or government projects that make greater use of locally available resources and endogenous capabilities, and require moderate rather than radical organizational changes, may prove to be not only less costly but also more sustainable in the long run. The building of domestic technological capabilities should become one of the priority concerns in the design of developmental programmes.

(a) At the national level

5. Science and technology education should start at an early age and be introduced in the programmes of primary- and secondary-level education. Girls should be strongly encouraged to learn about science on an equal opportunity basis with boys. The type of science education introduced should be applicable to the realities confronting the least developed countries.

6. Science and technology communities in the least developed countries tend to be small and concentrated in metropolitan areas. The mobility of science and technology personnel among research and development institutions, universities and the productive sector should therefore be encouraged in order to maximize their contribution to development. Mechanisms such as fellowships and exchange programmes or collaborative research and development projects of an interdisciplinary nature should be stimulated.

7. National education systems should endeavour to increase the number of technical schools and/or technical training programmes for the purpose of addressing the issue of the shortage of qualified support staff and middle-level science and technology personnel. Training activities should take into account needs of the private sector, through, for example, on-the-job training.

8. Incentives to enter science- and engineering-related professions should be strengthened, including through various forms of financial and professional compensation such as research grants, research contracts, or national recognition awards for research or innovation that contributes to national development. Scientists and engineers should be given a say in national policy-making.

9. To address the loss of human resources through the brain drain, incentives are needed to encourage expatriates to return home as well as qualified personnel to stay in their homeland. Such incentives can be based on an appeal to the desire to contribute to the country's development. Expatriates abroad must be considered a potential source of human resources, not necessarily

through their returning home permanently, but rather through short visits for training, lectures or consultations. Appropriate mechanisms are needed to facilitate their contribution from abroad, such as the Transfer of Knowledge through Expatriate Nationals (TOKTEN) programme of the United Nations Development Programme (UNDP). Measures should also be explored and promoted to mobilize and motivate available human resources in the country to contribute more effectively to the country's development.

10. National industrialization strategy should foster more locally based innovation and learning in the production process. More emphasis should be placed on the development aspects of research and development.

11. There should be a basic science training programme for teachers, aimed at promoting the understanding of their country's technological needs. Less emphasis should be placed on pure science, and its isolated pursuit in laboratories. There is a need to work on applications and to move from laboratories to pilot-scale operations.

12. Copying, within legal boundaries, might be an essential capacity-building activity at the first stage of development. Instead of the developing of pure basic science, there could be copying, learning, adopting and improving with respect to available technologies. Appropriate intellectual knowledge, skills and capacity should be developed.

13. Enterprises should be encouraged to promote technological innovations, for example through tax incentives for investments in science and technology.

14. Based on a thorough assessment of areas of inefficiency, there should be promotion of innovative institutions that are more responsive to the market and to local needs.

15. Recipient countries should be more actively involved in the specification of aid projects. The potential contribution of a project to the generation of local technological capabilities should be an important factor in the choice of projects.

16. Developing a set of criteria for identifying critical technologies for national development needs would be helpful in directing the development of local capacities. The availability of capabilities to decide on strategic issues and on allocation of resources is of critical importance.

17. The potential contribution of traditional knowledge systems, particularly in dealing with specific local problems, has not been fully grasped. More efforts should be devoted to understanding and documenting such knowledge.

18. To foster endogenous productive activities, it is important to change the common perception that imported products are superior to domestic ones. Other obstacles, such as the high cost of national production, must also be overcome.

(b) At the donor policy level

19. Donor projects can contribute to the development of the recipient country's endogenous capacity by maximizing the participation of local suppliers, subcontractors and technical personnel as part of programme policy.

(c) At subregional or regional levels

20. Governments should consider the possibility of collaboration on the development of a critical mass of resources and capacities at subregional or regional levels through, inter alia, the sharing of their experiences and experimental models. The pooling of resources, skills and capabilities could be an efficient way to address areas of weakness in any single country.

21. Scientific networks formed at these levels should also be focused to a greater degree on problems more specific to the region.

(d) At the international level

22. Development of appropriate human resources and institutional capacities in international cooperation programmes requires special attention.

2. Greater emphasis on infrastructures for and linkages of technology in science and technology policy

23. Technology should not be viewed merely as the application of hardware. Emphasis on infrastructural elements and technical know-how, as well as management and organization, is crucial for the sustainable and proper use of a technology. Other factors such as technical intelligence and sourcing capabilities are essential in the search for acquisition and assessment of external technologies. The commercialization or marketing of technology is necessary for its diffusion and widespread use. With this in mind, policy makers should pay more attention to the social and management aspects of technology.

(a) At the national level

24. Clear strategies should be formulated for priority objectives in industrial and agricultural development, for example. Only when such strategies are defined can technology resources be mobilized in the form of technology missions to address the developmental problems of highest-priority concern.

25. Science and technology policy should encourage the development of a technology assessment capability. The ability to access, process and analyse science and technology information is especially important in screening foreign investments in order to ensure their compatibility with and responsiveness to long-term national development goals.

26. Governments could assist firms in the financing, acquisition and application of external technologies (for example, through the setting up of a technology network for such purposes or the encouraging of alliances between domestic and foreign firms for technology information-sharing).

27. To assist technology users in the absorption process, Governments should also consider having national or regional extension services that could assist in troubleshooting or in the general process of learning a technology.

28. The commercialization of technology would be facilitated by the promotion of stronger linkages between research and development institutions, the productive sector and the market or consumer sectors.

(b) At the donor policy level

29. Donor programmes should place greater emphasis on the non-technical assets of technology choice. The transfer of hardware should be considered in the context of other factors such as the level of technical know-how required by the user or the local management, and compatibility with other local conditions.

3. Science and technology development and technology transfer as a response to demand

30. Science and technology development and technology transfer should be more demand-responsive with regard to suitability to local conditions and the sociocultural context. The adaptation of technology to local conditions will facilitate better management and maintenance of technology. The establishment of proper mechanisms should therefore be considered in order to provide a better articulation of the needs of the productive sector, particularly the agricultural sector which plays a major role in the economies of the least developed countries.

(a) At the national level

31. More effective mechanisms are needed for articulating local demand for technology and for reflecting specific national strategies, particularly with regard to the development of the private and the rural/agricultural sector.

32. Governments could also provide professional and financial incentives to encourage research and development institutions to respond to the needs of the productive sector. While the functioning of those institutions should be based on commercial principles, certain forms of government support, through contractual research, research grants and use of technical services, are needed.

33. The problem of the isolation of the science and technology communities in the least developed countries from the realities and needs of the rural areas should be addressed with strategies, mechanisms and policy incentives that encourage scientists and engineers to go into the field in order to enhance their understanding of real problems.

34. The role of science and technology policy should be considered in the course of the development of technologies in the rural/agricultural sector.

35. The application of new and emerging technologies in the rural/agricultural sector should be encouraged so as to upgrade traditional technologies. A knowledge of traditional methods is necessary for proper integration.

36. There is an urgent need for more accurate statistics in the least developed countries so as to increase the availability of data.

(b) At the donor policy level

37. Donor policy decision-making should reflect increased involvement and participation of relevant stakeholders, particularly end-users, so that a more appropriate choice of technology can be made. More local input in the design of programmes and feedback from end-users during programme implementation would facilitate local adoption of technologies. Donor programmes, especially those implemented in the traditional sectors, should be sensitive to sociocultural elements in order to allow for sustainable change.

38. The "tying" of aid restricts the flexibility of the least developed countries in making appropriate technology choices. Alternative specifications could be envisaged in project formulation so as to provide room for flexibility and choice.

39. The donor community could assist the least developed countries in gathering statistical data on science and technology resources and needs and in developing more appropriate science and technology indicators.

4. Generation of domestic demand for science and technology

40. Methods of generating domestic demand for science and technology include increasing public awareness of the role of science and technology and supporting potential users of science and technology in the private sector, especially small- and medium-sized enterprises and non-governmental organizations.

(a) At the national level

41. Governments, with the help of local scientists and engineers, could organize radio programmes and extension services to popularize science and technology.

42. The private sector can be a vibrant source of technology demand. Private sector activities would be facilitated by creation of appropriate legal frameworks, reduction of bureaucratic procedures, facilitation of access to market information, export promotion and supply of basic infrastructures to facilitate storage, transportation and distribution of products. Promotion of small enterprises should be part of a science and technology policy. Tax incentives, extension of credit and assistance in finding financial sources for local investment would encourage entrepreneurial activities.

43. Short-term courses in business/technology management and marketing could be provided to improve management capabilities. Mechanisms such as technology incubators, technology venture capital funds and business support systems can also foster private sector demand for technology.

44. Government support for the private sector should also be extended to non-governmental organizations. Such organizations are actively involved in productive activities in the rural sector and in need of support.

D. Implementation

45. The following guidelines are proposed for consideration by entrepreneurs and policy makers at the political level:

(a) Before proceeding with any development plan, a common understanding on its objectives should be achieved among all stakeholders involved;

(b) The scope of a development plan encompasses a variety of functions, resources and activities, with complex linkages and interactions. It is advisable to begin with an overview of all parties potentially involved in research and development, market research, system and product development, production, marketing and infrastructural functions and services, including governmental and legal provisions;

(c) Having identified the range of functions to be included in a plan, lead-times should be determined and respective measures conceived to activate the plans within a given time-frame. Potential obstacles should also be assessed;

(d) The activation process should include, inter alia, an assessment of those parts of a programme that can be covered by endogenous capabilities and efforts versus those functions that can be secured only from external sources;

(e) In assessing the functions of a development programme, the question of critical mass must be addressed. Critical mass depends not only on the span and volume of capabilities needed, but also on the envisaged time-frame. It can be reached through mobilization of existing resources, redirection and coordination of scattered but adjustable functions, cooperative arrangements on country-wide or regional levels, and training and education programmes;

(f) Having assessed all these factors, the implementation of a development plan can be carried out under a programme management-type function. The latter entails determination of principles and rules, estimates of total costs, design of financial plans, interfunctional management and linkage, and information systems;

(g) Within the range of functions of a development programme, a steering and control mechanism should be established for management control, review and approval of the various programme phases. Such a mechanism should also focus on the aspect of moving targets, thereby establishing a relationship between a development programme and a given time-frame;

(h) (Finally), the success of any programme depends heavily on motivation and a persistent will to achieve high-quality performance. The leadership function presupposes a continuous focus on these goals.

II. TECHNOLOGY IN INDUSTRIALIZATION

A. Privatization of publicly funded industrial research and development institutions

46. Publicly funded industrial research and development institutions exist in many countries. They constitute important components of each country's national system of innovation. In recent years, many Governments have followed policies designed to encourage market mechanisms and privatization. This trend has had repercussions on public industrial institutes which have been encouraged to become more market-oriented and to diversify their funding sources.

47. A number of international organizations, including the United Nations Industrial Development Organization (UNIDO) and the World Bank, are studying the transformations in the organization and management of public industrial institutes with the objective of becoming enabled to advise developing countries on this subject. Those organizations have indicated that they would welcome the advice of the expert group on the issue.

48. The following points summarize the ideas of the expert group on the subject of privatization:

(a) Privatization in this context does not necessarily mean transfer of the property of these institutions to the private sector. Rather, it means that their activities should become more demand-oriented and that the recipients of the services should pay a measure of the costs;

(b) The issue is particularly important for developing countries which could benefit from the experience acquired by the developed countries in the process of privatization;

(c) The active participation of private industries does not necessarily mean a reduction in the public funds allocated to research and development. Rather, the objective is the following: that the public and private funds spent in publicly funded industrial laboratories become more effective in promoting industrial development;

(d) The transformation of publicly funded laboratories would offer an opportunity to bring industrial research and services closer to the needs of users;

(e) Policies to guide the privatization process should be country-specific and, in general, oriented towards enabling industrial research to approach a customer-supported condition. Governments should continue to support research activities that are not commercially viable but are still considered essential for infrastructure and long-term development;

(f) The basic notion to be kept in mind in conducting the privatization process is that in all countries the Government has a role in promoting and financing research, even if a well-established market economy is predominant;

(g) There are several types of research that Governments must support: basic research; applied research that is carried out in the public interest and

not likely to become commercially exploitable; and research, connected with certain strategic research programmes, whose commercial value lies beyond the economic horizon of industry;

(h) Since small enterprises as a whole employ most of the industrial workforce in every country, industrial laboratories should design their policies so that those enterprises can benefit from their services; this might require, inter alia, the involvement of laboratories in those services such as extension, training, testing, information and normalization that small industry cannot organize by itself. Governments should promote networking among small enterprises;

(i) Public funds may be used to subsidize the costs of industrial research in the form of grants, and reimbursable grants and loans. Projects and services rather than institutions should be supported. Another promotion method involves subsidizing interest rates on loans;

(j) Due attention should be paid to the product development and marketing phase which could use some form of public support through, for example, product development loans, venture capital facilities and special public procurement. For this purpose, Governments should initiate and promote the mobilization of resources from local, regional and international banks;

(k) Another method of channelling public funds to finance private technology projects involves a tax deduction for the enterprises that commission research projects to industrial laboratories;

(l) In order to increase the chances of success of the privatization process industrial research institutions should be headed by experienced managers; in any case, the various stakeholders should be represented on the governing boards of those institutions;

(m) In small countries belonging to a homogeneous economic region, industrial laboratories and services could be best organized and sustained if conceived as regional institutions;

(n) In the case of the least developed and some other developing countries, policies should be designed to encourage multinational corporations to subcontract part of their research to local industrial laboratories;

(o) Every country should promote the understanding of local technological needs and design policies to stimulate the demand for the development of appropriate technologies.

B. Role of technological cooperation in fostering regional economic integration

1. Philosophy

49. The participants emphasized the role of new technologies in the process of regional economic integration and in the globalization of the world economy. The proliferation of transport and communications technologies has brought countries closer together and increased the opportunities to share and accept new concepts and ideas that can contribute to a better quality of life for people in developing countries.

50. Technological leadership has, in a way, forced the advent of such integration as a means for improving quality of life through a demonstrated sharing of benefits in all areas that affect people's lives.

51. As a rule, regions that have achieved an appreciable measure of integration have been able to benefit from the existence of a good technological base, a substantial industrial infrastructure and a local market where private and public sectors have collaborated closely. Integration has helped to further encourage economies of scale. For some developing countries, the development of endogenous capacity to meet basic local needs will be the prerequisite to achieve the conditions, including political ones, needed for participating in regional economic integration. Mass participation in decision-making through a process of democratization is necessary to enable sustained development, application of science and technology and, through this, industrial economic development. In the above-mentioned context, the objectives of regional technological integration should be:

(a) To create a climate conducive to dialogue between companies and research institutions;

(b) To establish joint ventures among companies and research institutions from two or more countries;

(c) To develop new products, processes and services, and to improve the quality of existing ones, in order to expand market share;

(d) To achieve homogeneous international standards of quality;

(e) To enhance the productive capacity existing in each country;

(f) To improve the quality of life.

(a) Factors that favour regional economic integration

52. The contribution of technology to the strengthening of regional economic integration can be significant only if certain preconditions are met. These are:

(a) The possibility of extending the economies of scale in production or reaching a critical mass of resources;

(b) The motivation of those interested in pooling resources to achieve common goals, and the willingness of entrepreneurs to undertake joint ventures, and of researchers to undertake joint and collaborative projects;

(c) The existence of organized databases to enable easy access to scientific, technological and economic information;

(d) Suitable communications, including transportation facilities;

(e) The political will of leadership backed by a commitment to pursue economic integration in spite of preliminary difficulties of various kinds;

(f) The existence of a legal framework that can favour the development, manufacture and marketing of goods, and the free flow of goods and services across boundaries. This may include harmonization of fiscal and other incentives.

53. With regard to all the above factors, Governments should act as catalyzers to facilitate the establishment of initial funds for joint technological projects. The private sector will thus be encouraged to pursue the process leading towards the achievement of the desired level of economic integration.

(b) Economic integration in developing countries

54. In the past two decades, many developing countries have made attempts to achieve a certain measure of economic integration in their own regions and subregions through technological cooperation. In many cases, internal political instability and cross-border political strife have hindered such integration.

55. A recently launched example of regional integration in Latin America is the Bolivar Programme: an initiative to foster cooperation among companies, research centres and public and private institutions in the creation of a new system of relationships among the various scientific, technical and industrial sectors. These new alliances, based on the dynamics of the private sector and the promotional role of the State, are intended to contribute to the development of productive capability in Latin America and the Caribbean, thereby improving the competitiveness of the region's goods and services in international markets.

56. In the African region, economic groupings in the subregions have been established, and the Intergovernmental Committee of Experts for Science and Technology for Development in Africa and its subregional working groups are contributing to the process of economic integration. Also, the African Economic Community is being established, with a protocol on science and technology, with the support of the Organization of African Unity (OAU) and the Economic Commission for Africa (ECA). In the Asian region, the Association of South-East Asian Nations (ASEAN) programme has been successful in utilizing science and technology as a means to achieve economic integration. In the area of infrastructure, the ASEAN programme has already established subregional electrical grids and, in the area of human resource development, common training facilities.

2. Areas of interest

57. The expert group identified the specific technologies that appear to have the highest potential for contributing significantly to the integration and industrialization process in developing countries, regardless of their level of development.

58. The following technologies or topics are listed in the order of their potential contribution to the integration process:

(a) Information, communication and transportation facilities;

(b) Biotechnology, with its potential to solve the food problems in developing countries;

(c) Energy technologies, with emphasis on the environment, cooperation and industrial development in developing countries;

(d) New technologies: their effect on development and on regional economic integration;

(e) The role of private industry in socio-economic development in general and in technological integration in particular.

3. Ways and means

59. Integration through technology should be a step-by-step process, through a trickle-down or trickle-up approach, or a mix of the two. However, the trickle-up approach is recommended as more sustainable.

60. For example, the ASEAN programme of integration through technology includes the following steps:

(a) Free movement of people through tourism;

(b) Establishment of common training facilities;

(c) Establishment of common financial infrastructures such as the Asian Finance Investment Corporation;

(d) Use of common infrastructure for advanced science and technology.

61. Another method for achieving smooth integration through technology is via harmonized technical specifications and standards. Using common standards promotes increased cooperation among the countries involved and also leads to sharing expertise in subsequent technological choice, maintenance, repair, training, research and application through production.

62. A third method is to use public incentives to stimulate private initiatives. Those incentives can be financial or institutional and they should also be included in the legal framework.

63. The three methods mentioned above are not mutually exclusive but, rather, complementary. Programmes leading to regional integration should be extended to include participation of other regions, wherever possible.

III. VIEWS ON THE COMMISSION ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

64. The expert group, consisting of 14 members of the former Advisory Committee on Science and Technology for Development, welcomed the opportunity to carry out a review of the past experiences of the Advisory Committee as the basis for determining its views on the activity of the new Commission on Science and Technology for Development. A need for change was recognized. In recent years, the Intergovernmental Committee on Science and Technology for Development, as well as the Advisory Committee, appeared to have had insufficient impact.

65. The Advisory Committee had contributed through its reports to the Intergovernmental Committee. Those reports attempted to clarify issues and to recommend practical guidelines for action. It was understood that a number of the reports, especially those addressing the issues of endogenous capacity-building, innovation and sustainable development, were well regarded by international agencies and national Governments.

66. The Commission on Science and Technology for Development should note the general positive characteristics of the work of the Advisory Committee, including, in particular:

(a) Composition of the Advisory Committee: Its representative mix of highly competent stakeholders concerned with science, technology and development had had a positive bearing on the topics discussed;

(b) Size of the Advisory Committee: The Advisory Committee had consisted of 28 members, with an average of 22 attending the meetings. This had been a number large enough to ensure adequate professional and geographical representation and small enough to enable constructive debate and active participation of all members;

(c) Style of work: At its annual meetings, a roughly equal amount of time had been spent in small working groups and in plenary sessions. This had proved to be a productive way of conducting the Advisory Committee's business;

(d) Frequency of meetings: Besides annual meetings of the full Advisory Committee, opportunities had been provided for selected Advisory Committee members to participate in panels and task forces which met more frequently to consider specific topics. The good communication and trust that had been achieved between members was instrumental in enabling them to reach a consensus on difficult issues;

(e) Location of meetings: Whenever possible, meetings had been held in developing countries. This had contributed to the relevance and continuity of the discussions and to the full commitment of the members, including opportunity for extensive interaction between the Advisory Committee and government officials and local scientists of the host countries;

(f) Secretariat support: This was provided by the Advisory Committee secretary and other staff of the former Centre for Science and Technology for Development of the United Nations Secretariat. The quality of support had been an important factor in the success of the meetings and in the provision of continuity between meetings.

67. The former Advisory Committee's weaknesses, which the Commission should recognize, included:

(a) The limited amount of time that most Advisory Committee members could devote to the work of the Advisory Committee: Very few members had been able to respond to requests for advice from either the Advisory Committee's Chairman or its secretariat between sessions;

(b) The lack of first-hand contact and dialogue with representatives of agencies of the United Nations system: It had been only in the last 18 months of the Advisory Committee's existence that efforts were made to make the potential benefits of the Advisory Committee better known to those parts of the United Nations actually involved in applying science and technology to development. During that time, good contacts had developed with UNDP, UNIDO and the United Nations Educational, Scientific and Cultural Organization (UNESCO), and the possibility of further interaction with other principal United Nations bodies was becoming more apparent;

(c) The lack of interaction between the Intergovernmental Committee on Science and Technology for Development and the Advisory Committee: There had been very little feedback from the Intergovernmental Committee on Advisory Committee reports.

68. The principal problem, however, appears to have been the lack of a well-defined role for the Intergovernmental Committee within the United Nations system. The members of the Advisory Committee had not been sufficiently familiar with the work of the Intergovernmental Committee to explain its failure, but expressed the hope that the Commission would be accorded a clear and specific task.

69. The views of the expert group are summarized as follows:

(a) A clear mandate should be established for the Commission identifying its relationship with the Economic and Social Council and the General Assembly, and ensuring that it receives regular feedback on its recommendations and observations;

(b) A Bureau of the Commission, with appropriate regional representation, should be empowered to take action on behalf of the Commission between its sessions. The Bureau could meet at least semi-annually;

(c) The Commission should be serviced by a strong secretariat.

70. It is recommended that the Commission, in order to perform its envisaged role, should take into account the following, namely, that its secretariat:

(a) Should not be involved in servicing operational projects in developing countries;

(b) Could be strengthened by short-term secondment of high-calibre staff from national Governments and the private sector;

(c) Should be assisted in its work by advisory panels consisting of experts appointed by the Secretary-General of the United Nations. These panels would incorporate the best features of the former Advisory Committee and be encouraged and empowered to provide advice to all the relevant operational agencies of the United Nations system;

(d) Should be responsible for preparing background papers on topics requested by the Commission or the advisory panels;

(e) Could also play a substantial role in disseminating the views of its advisory panels and of the Commission;

(f) Should be a focal point for information about all of the activities of the United Nations system that relate to science and technology for development. This would imply both the collection of information and its dissemination.

IV. ORGANIZATIONAL MATTERS

A. Opening and duration of the Meeting

71. The Meeting of High-level Experts on Science and Technology for Development was held in Bujumbura, Burundi, from 4 to 8 May 1992.

72. The Prime Minister of Burundi welcomed the participants and thanked the experts for having chosen Burundi for their meeting. He said that the Meeting was taking place while the country underwent a process of democratization. The Government of Burundi was particularly committed to science and technology. The objective of research in Burundi was to solve urgent social problems including the need to increase the production of food and energy in order to alleviate health and environmental problems. He pointed out that despite political will, research in Burundi still faced many problems such as insufficient human, material and financial resources. The country still lacked a clear science and technology policy and adequate mechanisms to implement it. He concluded by expressing his hope that the Meeting would formulate clear and efficient strategies that could be helpful to those people who had not yet benefited from science and technology.

73. In his opening statement, the Chief of the Science and Technology Branch of the Science, Technology, Energy, Environment and Natural Resources Division of the Department of Economic and Social Development of the United Nations Secretariat thanked the Government of Burundi for hosting the meeting and for providing efficient support. Referring to the restructuring of the United Nations, in particular to the creation of a Commission on Science and Technology for Development, he requested the advice of the expert group on the future role of the new Commission. He also expressed his appreciation for the valuable contribution made by the former members of the Advisory Committee on Science and

Technology for Development and especially by its former Chairman. With respect to the issue of the least developed countries, he expressed the feeling that one advantage possessed by such countries, as latecomers to the development process, was the possibility of their avoiding certain mistakes made by developed countries in the past. Regarding the substantive theme for 1993, he invited the group to consider a vision of regional economic integration on the one hand, and the potential of the new technologies for industrialization of the developing countries on the other. Finally, he expressed the hope that in the new climate of cooperation within the international community and particularly within the United Nations, it would be possible to provide the assistance needed by the South in strengthening scientific and technological capacities.

74. The Chairman of the former Advisory Committee expressed his sincere gratitude for the warm welcome extended by the host country. The Advisory Committee over the past few years had addressed important issues, and was aware that while advances in scientific research resulted in contributions to development, the application and the diffusion of technology played equally significant roles. With respect to each of the issues related to science and technology dealt with by the Advisory Committee, an analysis had been made, recommendations for Governments developed, and practical steps for the international community suggested. He referred to various preparations made for this meeting, including case-studies, the mission of a small Advisory Committee team and a review of international literature on the subject. The small size of the scientific and technological community of the least developed countries made them vulnerable in many respects, and lacking in resilience with respect to shocks. The question before the expert group was how to draw on science and technology for the purpose of tackling the problem of vulnerability. The Chairman hoped that the expert group could make a small contribution in that regard.

B. Election of officers

75. The following officers were elected at the Meeting of High-level Experts on Science and Technology for Development:

Chairman: Geoffrey Oldham

Vice-Chairmen: Dulce Arnao de Uzcategui
Donatien Bihute
Elizabeth Birman

Rapporteur: Meneleo J. Carlos, Jr.

C. Adoption of the agenda

76. The Meeting of High-level Experts adopted an agenda that read as follows:

1. Adoption of the agenda and organization of work.

2. Election of officers.

3. Science and technology for the least developed countries.

4. Role of technology in industrialization and regional economic integration.

5. Transformation of the Intergovernmental Committee on Science and Technology for Development and the Advisory Committee on Science and Technology for Development into the Commission on Science and Technology for Development.

6. Consideration and adoption of the report.

Annex I

LIST OF PARTICIPANTS

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Annex II

LIST OF DOCUMENTS

Document number	Title or description
ST/BURUNDI/1	Provisional agenda
ST/BURUNDI/2	Organization of work
ST/BURUNDI/3	Report of the Panel on Science and Technology for Least Developed Countries and Other Small Developing Countries
ST/BURUNDI/4	Case-study on Burundi: Promotion of science and technology and endogenous scientific and technological capacities in Burundi
ST/BURUNDI/5	Report of the Advisory Committee on Science and Technology for Development review team on the assessment of science and technology in Burundi
ST/BURUNDI/6	Note on technology in industrialization and regional economic integration
ST/BURUNDI/6A	Innovation and development
ST/BURUNDI/6B	Outline of report on technology and industrialization
ST/BURUNDI/6C	Role of innovation for development
ST/BURUNDI/7	Relevant sections of the draft Agenda 21
ST/BURUNDI/8	Overview of the 10 years' work of the Advisory Committee for Science and Technology for Development
ST/BURUNDI/9	Note on the Commission on Science and Technology for Development

Additional document

Latin American Commission on Science and Technology (CONICIT) (1992). Bolivar Programme: Regional Technological Integration and Industrial Innovation and Competitiveness. Caracas: CONICIT.

UNITED
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COMMISSION ON SCIENCE AND TECHNOLOGY
FOR DEVELOPMENT
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12-23 April 1993
Item 5 of the provisional agenda*

AD HOC PANELS/WORKSHOPS TO EXAMINE SPECIFIC ISSUES OF SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

Organization of ad hoc panels/workshops on specific issues of science and technology for development

Report of the Secretary-General

SUMMARY

The former Intergovernmental Committee on Science and Technology for Development relied on the advice of the Advisory Committee on Science and Technology for Development for specialized information concerning various aspects of science and technology, with particular emphasis on proposals for policy and endogenous capacity-building. During its existence, the Advisory Committee organized 14 ad hoc panels of specialists, drawing on its own members and other international experts, in order to best serve the Intergovernmental Committee in its advisory role. Those 14 panels covered a wide range of topics of high importance to developing and developed countries and, in many cases, provided the background documentation needed for consideration of major themes by the Intergovernmental Committee.

The Commission on Science and Technology for Development may wish to consider means of securing independent expert advice. In particular, the Commission may wish to continue the process of organizing up to two expert panels per year.

* E/CN.16/1993/1.

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I. BACKGROUND

1. In decision 1992/218 of 30 April 1992, the Economic and Social Council, recalling General Assembly resolution 46/235 of 13 April 1992 on the restructuring and revitalization of the United Nations in the economic, social and related fields, decided, inter alia, to establish a functional Commission on Science and Technology for Development.

2. The General Assembly, in paragraph 7 (a) (i) of the annex to its resolution 46/235, had proposed that such functional commission should examine at its first session the question of funding arrangements and the modalities for the convening of ad hoc panels/workshops which would meet inter-sessionally to examine specific issues of science and technology for development within the framework of General Assembly resolutions 34/218 of 19 December 1979 and 41/183 of 8 December 1986. In that connection, the Commission could consider the practice of the Advisory Committee on Science and Technology for Development.

3. The Intergovernmental Committee on Science and Technology for Development, in its resolution 7 (II) of 4 June 1980, had decided to establish an advisory body on science and technology for development. 1/ The terms of reference of the United Nations advisory body on science and technology for development had stated 2/ that the advisory body should have the access to the advice of ad hoc panels drawn from a roster of specialists in all the necessary disciplines, established by the advisory body as necessary, some of whose members should be drawn from the membership of the advisory body.

4. The Intergovernmental Committee, in resolution 3 (III), section IV, paragraph 4, of 5 June 1981, 3/ had recommended that the General Assembly should authorize the Advisory Committee to constitute a maximum of four ad hoc panels during the next two years in accordance with the terms of reference of the Advisory Committee, on the understanding that no more than two ad hoc panel meetings should be held each year and that those meetings should be of a duration of not more than one week.

5. Since then, the Advisory Committee on Science and Technology for Development had been authorized to hold two ad hoc panel meetings each year, the cost of which was reflected in the programme budget (section 18) 4/ of the former Centre for Science and Technology for Development of the United Nations Secretariat.

6. The Advisory Committee, at its plenary sessions, had decided on a specific topic, drawn up the terms of reference of each of the panels organized, and been represented by several of its members. The report of each panel, including its recommendations, was considered by the Advisory Committee at its session following the panels. The concluding discussion of the topic was reflected in the report of the Advisory Committee.

II. THE PANELS: AN OVERVIEW

7. The Advisory Committee convened its first ad hoc panel of specialists in 1982, and its last in 1990. During this eight-year period a total of 14 expert panels were organized, covering topics as varied as blending traditional and new technologies, and science and technology for drought and desertification. Some of the panels examined immediate problems (for example, food security), and others focused on long-term perspectives. They covered methodological issues (for example, measurement of the impact of science and technology) and institutional ones (for example, linkages among research, development and production). However, all of those panels had four crucial elements in common: they were directed towards development objectives; they were geared to policy-making; they were geared to endogenous capacity-building; and they helped to provide information for the discussions of the Intergovernmental Committee on Science and Technology for Development.

8. A brief overview of those 14 panels is given below. In many cases, the deliberations of the panels resulted in publications. Where this was the case, the publication has been cited. Where no publication is available, the document symbol of the panel report is provided.

9. Panel I was the Ad Hoc Panel of the Advisory Committee on Science and Technology for Development on Integrated Application of Emerging and Traditional Technologies for Development. It met at Los Baños, the Philippines, from 13 to 16 December 1982 (see document A/CN.11/AC.1/111/2).

10. The Panel examined possible ways of achieving a beneficial blend of emerging and traditional technologies for development. It pointed out that national policies for technology choice, development and diffusion should contain three major components. First, traditional industries that had social, economic, ecological or cultural advantages should be preserved and enriched further through the introduction of suitable quality control and marketing techniques. Second, emerging technologies that were directly related to the socio-economic conditions prevailing in a country should be adopted so that the country would be able to achieve quantum jumps in technological advances. Third, steps should be taken to promote suitable blends of emerging and traditional technologies based on a clear understanding of such blends. Recent advances in micro-electronics and microprocessors, biotechnology, satellite communications and imagery, and solar and renewable energy technology could be harnessed to upgrade traditional skills and occupations. The new era of innovations in high technology had induced a remarkable transformation of industrial technologies and production structures in the 1980s. Blending had the capacity to result in a move from centralized mass production to versatile, flexible small-scale production and decentralization and dispersal of industry to local areas.

11. The proceedings of this Panel were published in New Frontiers in Technology Application: Integration of Emerging and Traditional Technologies, Ernst U. von Weizsacker, M. S. Swaminathan and Aklilu Lemma, eds. (Dublin, Tycooly International Publishing, Ltd., 1983).

12. The Panel also led to a follow-up workshop of "Pioneer projects on the integration of emerging and traditional technologies" (held in Tokyo, Japan,

from 27 to 29 April 1984) which was sponsored by Japanese industries through the Japanese Association for Promotion of International Cooperation (APIC), Tokyo, to discuss specific proposals for pioneer projects for blending technologies. The report of this Workshop was published as Pioneer Projects on the Integration of Emerging and Traditional Technologies (Tokyo, APIC, 1984).

13. Panel II was the Ad Hoc Panel of Specialists of the Advisory Committee on Human Resources Development for the Planning, Management and Implementation of Science and Technology Programmes in Developing Countries, which met at Shuwáikh, Kuwait, from 8 to 11 January 1983.

14. As stated in the report of the Panel (A/CN.11/AC.1/III/3), one of the main bottlenecks to the application of science and technology to development was a general lack of managerial capacities in the developing countries. In the context of the Panel, this referred specifically to management of science and technology activities related to development. The Panel noted that while many elements of science and technology management principles and practices were generally valid for both developed and developing countries, critical differences lay in the fact that most developing countries were dependent on external sources for the choice, acquisition and transfer of technology; that institutional infrastructure was limited; and that resources were scarce.

15. The Panel examined obstacles and future action. Its emphasis on the need for a better understanding of individual national experiences in developing countries led to a follow-up interregional seminar, held in Moscow from 8 to 27 October 1984, on "Planning and management of science and technology for development: methods, prospects and trends", in which case-studies from 21 developing countries were discussed.

16. The results of the Moscow meeting were published in Trends and Prospects in Planning and Management of Science and Technology for Development, M. Anandakrishnan, ed. (Moscow, 1984).

17. Panel III was the Ad Hoc Panel of Specialists on the Role of Regional Associations and Organizations in Strengthening Research and Development and in the Popularization of Science and Technology in Developing Countries, which met at Tunis, Tunisia, from 6 to 10 April 1983.

18. As pointed out in the foreword to the report of the Panel (A/C.11/AC.1/IV/2), the strength of many of the non-governmental organizations and associations was unique by virtue of the involvement of a wide cross-section of development communities, including working scientists and technologists, policy makers, planners and the public at large, in their programmes and activities. Their resources, if properly mobilized, could be used to enhance the benefits of science and technology to the people at the grass-roots level, through such programmes as those relating to their education, environmental health and sanitation, economy, employment and energy needs. Such organizations in developing countries could become an indispensable part of the interactive development mechanism, particularly with respect to strengthening research and development, popularizing science and technology and providing information in the areas of policy-making and planning. The Panel outlined ways and means by which non-governmental organizations, particularly at the regional level, could assist in the strengthening of endogenous capacity-building.

19. The proceedings of the second and third panels were published jointly in Planning and Popularizing Science and Technology in Developing Countries, M. Anandakrishnan, ed. (Oxford, Tycooly Publishing, Ltd., 1985).

20. Panel IV was the Ad Hoc Panel of Experts on Science and Technology and Women, which met in South Hadley, Massachusetts, from 12 to 16 September 1983.

21. Women constitute approximately half the population in all countries, yet they have been systematically excluded from positions of power in policy-making for science and technology as well as in research and development. This has a strong negative effect, not only on women themselves, but also on the pace and the path of development. The Panel (see document A/C.11/AC.1/IV/4) examined the issues related to the participation of women in policy-making and decision-making; their contribution to endogenous research and development; their participation in education and communication in the areas of science and technology; and the selection, design and development of technologies that did not adversely affect women as well as those that might also assist them in their dual role of manager of the household and contributor to economic activity.

22. The results of the Panel were published in Science, Technology and Women: A World Perspective, Shirley M. Malcom and others, eds. (Washington, D.C., American Association for the Advancement of Science, in cooperation with the Centre for Science and Technology for Development of the United Nations Secretariat, 1985).

23. Panel V was the Ad Hoc Panel of Specialists on the Reinforcement of Linkages between Research and Development Activities and the Production System, which met in Lima, Peru, from 11 to 14 October 1983.

24. The Panel (see document A/CN.11/AC.1/IV/3 and Corr.1) explored ways to organize research and development programmes; create flexible and appropriate linkages to promote supplier-user interactions at national, regional and international levels; and design policy instruments to encourage and finance research and development. Three case-studies - from India (Hindustan Lever), Nigeria (commercial production of cassava), and Bolivia (commercialization of milk substitutes) - were discussed, and pioneer projects suggested in such areas as technological services delivery systems for small industries; a local technology system for rural areas; a fund-syndicating technology delivery system for enterprises and investors; linkages to improved productivity in underutilized capacity; and identification of needs in the least developed countries.

25. The proceedings of the Panel were published in Research and Development: Linkages to Production in Developing Countries, Mary Pat Williams Silveira, ed. (Boulder, Colorado, Westview Press, 1985).

26. Panel VI was the Ad Hoc Panel of Specialists on the Measurement of the Impact of Science and Technology on Development Objectives, held in Graz, Austria, from 2 to 7 May 1984.

27. Current indicators used to measure the effect of science and technology in developing countries had been formulated based on conditions and assumptions that were primarily relevant to developed countries. The Panel suggested that

those indicators, when applied to developing countries, often led to inaccurate conclusions (see document A/CN.11/AC.1/V/2). Speaking from their own experiences, the Panel members examined issues involved in assessing the effects of science and technology, and analysed the problems of constructing and applying accurate science and technology indicators relevant to developing countries. In addition to assessment and methodological questions, the work of the Panel included case-studies from Brazil and China.

28. The proceedings of the Panel were published in Science and Technology Indicators for Development, Hiroko Morita-Lou, ed. (Boulder, Colorado, Westview Press, 1985).

29. Panel VII was the Ad Hoc Panel of Specialists on Long-term Perspectives on Science and Technology for Development, which met in Mbabane, Swaziland, from 21 to 26 November 1984.

30. The Panel explored the interrelationship during the 1980s between changes and trends in the global economic, social and political environment, on the one hand, and those in science and technology on the other. While many developing countries had made important strides during the 1960s and 1970s towards building a basic scientific infrastructure and increasing their technological capabilities, the closer links between scientific capabilities, developments in technology and economic growth, the increasing costs of scientific research, the accelerating obsolescence of research capabilities, the emergence of new interdisciplinary fields, and the growing complexity of the institutional setting for the conduct of research were making it more difficult for most developing countries to push quickly towards the frontiers of knowledge and take advantage of new advances. At the same time, the slow-down in the rates of economic growth and other problems were undermining the long-term efforts required to build science and technology capabilities. The Panel explored new strategies for science and technology for development, the role of policy instruments to implement those strategies, and the importance of multilateral cooperation in such plans.

31. The material from the Panel was used as background information for the report of the Secretary-General (A/CN.11/62) on the mid-decade review of the implementation of the Vienna Programme of Action: progress at the regional level, presented to the Intergovernmental Committee on Science and Technology for Development at its seventh session.

32. The Panel report itself was issued as the Report of the Ad Hoc Panel of Specialists on Long-term Perspectives on Science and Technology for Development, organized in cooperation with the Royal Swaziland Society for Science and Technology and the University of Swaziland and with the support of the Government of Swaziland (A/CN.11/AC.1/V/3 and Corr.1).

33. Panel VIII was the Ad Hoc Panel of Specialists on Scientific and Technological Information Systems for Development, which met in Rome from 21 to 25 January 1985.

34. Thousands of scientific and technical publications of all kinds on a wide number of subjects are issued daily throughout the world, and the number is increasing dramatically. However, that information can be useful only if the

end-users for whom it is intended know of its existence and are prepared to use it. Unfortunately, this is often not the case for developing countries. The Panel examined the need in developing countries for the collection, processing, storage, retrieval and dissemination of scientific and technological information within national boundaries and through international channels. Particular emphasis was placed on the endogenous capacity-building required to perform these functions. This included an assessment of the need for a global network.

35. The work of the Panel and its report (A/CN.11/AC.1/V/4) formed the major content for discussion by the Intergovernmental Committee on Science and Technology for Development at its seventh session, for which the following substantive theme had been chosen: information systems for science and technology for development.

36. The proceedings of the Panel were also published in Scientific and Technological Information for Development (United Nations publication, Sales No. E.85.II.A.7).

37. Panel IX was the Ad Hoc Panel of Specialists on Mobilization of Financial Resources for Scientific and Technological Development in Developing Countries, which met in Islamabad, Pakistan, from 4 to 10 November 1985.

38. The Panel looked at human and financial resources from the perspective of their symbiotic relationship. That perspective was based on the underlying premise that either one was by itself of little value without the other. Resource mobilization for science and technology for development requires a direct, explicit and strategic approach. The Panel made specific proposals on a range of policy instruments designed to augment financial resources and to train and deploy skilled human resources more effectively towards endogenous scientific and technological development. The main emphasis was placed on national policies and sources of financing, but the role of external funds was also explored.

39. The report of the Panel (A/CN.11/AC.1/VI/3) formed the basis for discussions at the eighth session of the Intergovernmental Committee, which had chosen the mobilization of resources for science and technology for development for developing countries topic as one of the substantive themes for in-depth consideration at its eighth session. (See the report of the Secretary-General entitled "Substantive theme: mobilization of resources for science and technology for development for developing countries" (A/CN.11/70).)

40. Panel X was the Ad Hoc Panel of Specialists on Science, Technology and Food Security, which met in Harare, Zimbabwe, from 7 to 13 January 1986.

41. The central thrust of the panel discussion was to draw attention to the need for a food security strategy based on a food systems approach and oriented towards small and subsistence farmers. The concept of food systems refers to the whole complex of human and environmental interactions relating to food production, processing, exchange and consumption. It stresses feedback between component elements, is concerned with the place of food within the larger context of environmental resources and social contexts, and emphasizes the need to design, develop and elaborate systems that guarantee access to food by everyone.

42. The report of the Panel was issued as a document of the Advisory Committee (A/CN.11/AC.1/VI/2).

43. Panel XI was the Ad Hoc Group of Experts on Mobilization of Human Resources for Scientific and Technological Development in Developing Countries, which met in New York, from 29 to 31 January 1986.

44. The Panel discussed ways in which human resources - including not only scientists, engineers and the academic community, but also policy makers, administrators, industrialists, financiers, entrepreneurs, labour and the community at large - could be mobilized to work for development through institutions, organizations, and management practices. One important means of mobilization was the organization of a selected number of technology missions. Through such missions, human resources could be effectively and efficiently used. At the same time, people working in a team to achieve a specific objective were usually highly motivated and rewarded with a sense of accomplishment. The Panel also discussed a number of other means available for mobilization including national policies and plans.

45. The results of the Panel were issued as the Report of the Ad Hoc Group of Experts on Mobilization of Human Resources for Scientific and Technological Development in Developing Countries (A/CN.11/AC.1/VI/4).

46. Panel XII was the Ad Hoc Group of Experts on the Impact of New and Emerging Areas of Science and Technology on the Development of Developing Countries, which met at Buenos Aires, Argentina, from 8 to 12 December 1986.

47. This Panel reviewed the implications and impact of global technological developments in critical areas of science and technology, including micro-electronics and informatics, biotechnology and genetic engineering, new materials, and new and renewable sources of energy. It highlighted the need for integrated technology policies and planning to ensure effective absorption, blending and use of new technologies in the process of socio-economic development. Particular emphasis was placed on technology assessment and human resources development.

48. The report of the Panel (A/CN.11/AC.1/VII/2) was used as the basis for discussions at the ninth session of the Intergovernmental Committee, which had chosen the topic concerned, the impact of new and emerging areas of science and technology on the development of developing countries, as one of its substantive themes. (See the report of the Secretary-General entitled "Substantive theme: impact of new and emerging areas of science and technology on the development of developing countries" (A/CN.11/80).)

49. Panel XIII was the Expert Group on the Application of Science and Technology in the Study, Prevention, Monitoring and Combating of Drought and Desertification, which met at Ashkhabad, Union of Soviet Socialist Republics, from 13 to 16 January 1987.

50. In recent decades, and especially since the World Food Conference (1974) and the United Nations Conference on Desertification (1977), problems of drought and desertification have engaged national and international attention. A wealth of knowledge and several technological proposals for combating those problems

exist, but much of this has been biased towards isolated sectors, disciplines or technologies. It was the task of the Panel to review the available knowledge, and to suggest new approaches based on interdisciplinarity, as well as to compile a list of institutions and organizations that dealt with different aspects of drought and desertification from a scientific and technological point of view.

51. The report of this Panel (A/CN.11/AC.1/VII/3) formed the basis of discussions at the ninth session of the Intergovernmental Committee, which had chosen as one of its substantive themes the application of science and technology to the study, prevention, monitoring and combating of drought, desertification and other natural disasters.

52. Material connected with the results of the Panel appeared in the report of the Secretary-General (A/CN.11/79) entitled "Combating drought and desertification".

53. Panel XIV was the Panel of Experts on Technology Missions, which met in Warsaw, Poland, from 11 to 14 September 1990.

54. Based on discussions that had taken place during its regular plenary meeting, the Advisory Committee proposed that technology missions might provide an important means of furthering its work in endogenous capacity-building, sustainable development and international cooperation. The subject of such missions was also related to other important issues, such as technology blending, linkages between research and development and production, and innovation.

55. The Panel was therefore charged with the task of analysing the experiences in different countries in conducting various types of technology missions or their equivalent, of assessing their value, and of formulating guidelines for their use in other countries. Case-studies from seven geographical areas - India, Brazil, China, the Republic of Korea, Jamaica, West Africa and Italy - were examined.

56. The report of the Panel was issued as a document entitled "Core programme: report of the Panel of Experts on Technology Missions" (A/CN.11/AC.1/XI/2).

III. SUMMARY AND CONCLUSIONS

57. The ad hoc panels of specialists of the former Advisory Committee on Science and Technology for Development performed a number of critical functions. They assembled scores of the best experts from every region of the globe. They were able to focus on specific issues of immense importance to development. They provided seasoned, insightful, provocative material which was published in books and reports distributed throughout the world. Furthermore, they provided the specialized background material required for the substantive deliberation undertaken by the Intergovernmental Committee.

58. With the abolition of the Advisory Committee there is no longer a legislative authority to convene panels of specialists for the specific purpose of advising the new Commission on Science and Technology for Development.

59. In the context of establishing its working modalities, the Commission may therefore wish to consider convening a maximum of four ad hoc panels each biennium to advise it on specific topics.

60. The Commission may also with to consider the recommendation made at the Meeting of High-Level Experts on Science and Technology for Development, held at Bujumburo, Burundi, from 4 to 8 May 1992 (see document E/CN.16/1993/6, para. 70 (c)), namely, that these panels be encouraged and empowered to also provide advice to all the relevant operational agencies of the United Nations system.

61. As the Commission meets once every two years, the role of the panels of experts in carrying out in-depth examination of priority topics and thus providing substantive input for policy-making would appear to be of the utmost importance.

Notes

1/ See Official Records of the General Assembly, Thirty-fifth Session, Supplement No. 37 (A/35/37), part two, annex, sect. A.

2/ Ibid., resolution 7 (II), annex, para. 1 (d) (ii).

3/ Ibid., Thirty-sixth Session, Supplement No. 37 (A/36/37), part two, annex.

4/ Ibid., Forty-sixth Session, Supplement No. 6 (A/46/6/Rev.1), vol. I, sect. A.

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SCIENCE AND TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT: SCIENTIFIC AND TECHNOLOGICAL IMPLICATIONS OF SUSTAINABLE DEVELOPMENT

Implications of the outcome of the United Nations Conference on Environment and Development, including Agenda 21, for the work of the Commission on Science and Technology for Development

Note by the Secretary-General

SUMMARY

The present note provides, for consideration of the Commission on Science and Technology for Development, implications arising from Agenda 21 1/ (adopted at the United Nations Conference on Environment and Development) for the work of the Commission. In conformity with the mandate and the functions of the Commission, this note takes into account substantive as well as coordination implications.

* E/CN.16/1993/1.

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I. BACKGROUND

1. At its 19th plenary meeting, the United Nations Conference on Environment and Development, held in Rio de Janeiro, Brazil, from 3 to 14 June 1992, adopted the Rio Declaration on Environment and Development, 2/ a comprehensive programme of action called Agenda 21 1/ and the Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests. 3/ In addition, the United Nations Framework Convention on Climate Change and the Convention on Biological Diversity were opened for signature at the Conference.

2. In its resolution 47/190, the General Assembly took note with satisfaction of the report of the United Nations Conference on Environment and Development, 4/ and endorsed the Rio Declaration on Environment and Development, Agenda 21 and the Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests. In the same resolution, the Assembly urged Governments, organs, organizations and programmes of the United Nations system as well as other intergovernmental and non-governmental organizations to take the necessary action to give effective follow-up to the Rio Declaration on Environment and Development, Agenda 21 and the Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests. To this end, the Secretary-General, in paragraph 36 of his report on "Institutional arrangements to follow up the United Nations Conference on Environment and Development" (A/47/598), stressed the need to review and adjust the biennial work-plans of all subsidiary bodies of the Economic and Social Council, particularly those that had a clear mandate vis à vis certain chapters of Agenda 21, in order to respond to Agenda 21 requirements and to focus more sharply on the evolving concept of sustainable development.

3. Agenda 21 provides additional guidelines to Member States for developing science and technology policies and programmes that take into account the need for a balanced and integrated approach to environment and development. Science and technology is identified throughout Agenda 21 as an essential means to achieve sustainable development objectives in all countries.

4. A considerable number of chapters of Agenda 21 address specific science and technology-related provisions. In addition, the following two chapters deal exclusively with these important issues:

Chapter 34: Transfer of environmentally sound technology, cooperation and capacity-building

Chapter 35: Science for sustainable development

5. The Commission on Science and Technology for Development discharges specific functions in providing the Economic and Social Council with high-quality advice in the areas of science and technology, through analysis and the provision of appropriate policy recommendations or options. With respect to accomplishing those functions, the Economic and Social Council, in its resolution 1992/62, requested the Commission, as well as the other new

subsidiary bodies, to make recommendations, at its first session, about its future work programme, taking into account its respective mandate and the follow-up of the relevant provisions of Agenda 21.

II. IMPLICATIONS OF AGENDA 21 FOR THE WORK OF THE COMMISSION ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

6. The general orientation for the work of the Commission on Science and Technology for Development evolves from its functions, namely:

(a) To assist the Economic and Social Council in providing science and technology policy guidelines and recommendations to Member States, particularly developing countries;

(b) To provide innovative approaches to improving the quality of coordination and cooperation in the area of science and technology within the United Nations system, with a view to ensuring optimum mobilization of resources;

(c) To support, within the mandate of the Commission on Science and Technology for Development, the Commission on Sustainable Development that was to be established in accordance with the arrangements set forth in chapter 38 of Agenda 21.

7. In providing recommendations for its future work programme, the Commission on Science and Technology for Development should take into account as an additional guideline Programme 17, entitled "Science and technology for sustainable development", of the revised medium-term plan for the period 1992-1997 (A/47/6 (Prog. 17)).

A. Substantive implications

8. Implementation of Agenda 21 should be based on an action- and result-oriented approach. In providing recommendations for the future work programme of the Commission on Science and Technology for Development, which takes into account its mandate and the science and technology-related provisions of Agenda 21, the Commission should consider the following areas:

(a) Technology transfer and cooperation;

(b) Endogenous capacity-building in science and technology;

(c) Technology assessment in support of the effective management of technologies;

(d) Science for sustainable development.

9. Activities under the work area technology transfer and cooperation should be designed to assist Member States in the formulation of policies and programmes that promote and facilitate access to and transfer of environmentally

sound technologies, in particular to developing countries. Specific activities should include:

(a) Undertaking country/case-studies to assess the validity of barriers to access to and transfer of environmentally sound technologies, particularly to developing countries. (Most of the technology transfer studies that are conducted suggest their own barriers. There is a lack of solid knowledge about the barriers that are real and those that are perceived. Both categories are important, as perceived barriers can be as important in economic decision-making as real ones.);

(b) Examining existing and new policy tools available to suppliers and recipients of technologies, including subsidies, fees and taxes, fiscal instruments, technological benchmarking for the purpose of achieving environmental excellence, and rational pricing of resources, to determine whether they encourage or impede access to, and transfer and introduction of, environmentally sound technologies.

10. Activities under the work area Endogenous capacity-building in science and technology should be designed to assist Member States, in particular developing countries, in building the endogenous capacities needed to make appropriate decisions on science and technology options that are most suitable to those countries' needs and priorities. The objective of this programme area coincides with the overall objective of Programme 17 (para. 17.2) of the revised medium-term plan for the period 1992-1997, namely, to assist Member States, particularly developing countries, in developing endogenous capacities for designing science and technology policies and in assessing the potential of new technologies. Specific activities should include:

(a) Carrying out national policy dialogues to build a broad consensus on the use of science and technology options that are most suitable to countries' needs and priorities;

(b) Developing sustainable mechanisms for decision-making in science and technology.

11. Activities under the work area Technology assessment in support of the management of technologies should assist Member States, particularly developing countries, in building their capabilities for technology needs assessment. Specific activities should include:

(a) Building technology assessment capabilities for the management of technologies, including environmental risk assessment;

(b) Strengthening the international network of regional, subregional and national technology assessment institutions.

12. Activities under the work area Science for sustainable development should aim at improving the capacities of Member States, particularly developing countries, to generate scientific knowledge and technical know-how consistent with the countries' conditions and needs in the areas of environment and development. Specific activities should include:

(a) Substantiating the concepts of environmentally sound technology and sustainable development, taking into account the specific conditions and needs of developing countries;

(b) Assisting developing countries in determining priorities in scientific research and technological development that are consistent with long-term sustainable development objectives.

B. Coordination implications

13. The Commission should also review for its future work the relevant recommendations and proposals on international institutional arrangements to follow up the United Nations Conference on Environment and Development as contained in chapter 38 of Agenda 21. Those recommendations and proposals should be reviewed with respect to the coordinating function of the Commission in the area of science and technology within the United Nations system as well as its effective interaction with the Commission on Sustainable Development.

14. Improving the quality of coordination and cooperation with the other organs of the Economic and Social Council in the area of science and technology should not be seen simply as a process of avoiding duplication, but rather as a way of achieving synergy. This would be necessary since the implementation of the provisions of Agenda 21, particularly in developing countries, will have implications for the work programme of the agencies, organizations and organs of the United Nations system.

15. In conformity with its own functions and those of the Commission on Sustainable Development (as set forth in General Assembly resolution 47/191), the Commission on Science and Technology should determine specific organizational modalities for its interaction with the Commission on Sustainable Development. This would, inter alia, ensure the effective monitoring and reviewing of progress in the implementation of the science and technology-related provisions of Agenda 21 throughout the United Nations system.

Notes

1/ Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, vol. I, Resolutions Adopted by the Conference (United Nations publication, Sales No. E.93.I.8 (vol. I)), resolution I, annex II.

2/ Ibid., annex I.

3/ Ibid., annex III.

4/ Ibid., vols. I, II and III (United Nations publication, Sales No. E.93.I.8).

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SCIENCE AND TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT: TRANSFER AND APPLICATION OF ENVIRONMENTALLY SOUND ENERGY TECHNOLOGIES

Utilization and marketing of energy technologies, focusing on policy issues and options for the effective transfer and application of environmentally sound energy technologies

Report of the Secretary-General

SUMMARY

Technologies exist or are emerging on the market that hold considerable potential for the efficient and cleaner generation and use of energy. Policies are needed to provide options at both national and international levels for creating a favourable environment for the effective transfer and application of environmentally sound energy technologies in developing countries. Such policies should include the necessary institutional arrangements for the dissemination of information on available and emerging energy technologies and should identify sources of financing and other forms of assistance for technology transfer.

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INTRODUCTION

1. This report was prepared in pursuance of resolution 1 (XI), adopted by the former Intergovernmental Committee on Science and Technology for Development at its eleventh session. 1/

2. In preparing this study, extensive use was made of publications, particularly those submitted by the Department of Economic and Social Development, 2/ the United Nations Conference on Trade and Development, the United Nations Development Programme, the United Nations Environment Programme, the regional commissions, the United Nations Centre for Human Settlements, the World Bank, the World Intellectual Property Organization, and the United Nations Industrial Development Organization. In addition, the report draws on publications and interviews with a number of organizations external to the United Nations system, including the International Institute for Energy Conservation, which has initiated several programmes for the commercialization and transfer of environmentally sound energy technologies for developing countries.

3. Various examples taken from the institutional and legislative experiences of a number of countries are provided. In addition, major activities of the United Nations system in areas related to the theme are included.

4. Section I provides a brief description of the range of available and emerging energy technologies. Section II discusses policy issues and options for the effective transfer and application of environmentally sound energy technologies, particularly with regard to appropriate domestic and transfer policies, capacity-building, financing and other forms of assistance. In section III a number of conclusions are proposed.

5. The activities suggested in the report would ensure the active participation of the Commission on Science and Technology in translating Agenda 21 recommendations (see A/CONF.151/26/Rev.1 (vol. I)) into concrete policies and measures.

I. THE TECHNOLOGY

A. Fossil fuel technologies

6. Coal provides the basis for meeting about 30 per cent of world energy demand and 47 per cent of electricity demand. At the same time, coal mining and combustion are sources of heavy pollution, underscoring the need to identify, commercialize and transfer clean-coal technologies. Technologies exist or are emerging on the market which appear to hold considerable potential for the efficient and cleaner generation of electricity based on coal resources. In this connection, a series of conferences organized by the Department of Economic and Social Development were held recently in China, India and Germany to examine both the technological and policy options available to promote clean-coal technologies for developing countries. 3/

7. Mine production incentives based on energy production instead of tonnage minimize the use of coal with high ash content. Nevertheless, high ash and sulphur levels sometimes exist in the raw coal. Therefore, various forms of coal upgrading should be considered to improve coal quality, including simple screening to meet the size specifications for effective combustion in fixed-grate (stoker-type) industrial boilers; traditional coal washing to reduce ash and sulphur; and advanced coal washing to produce coals of ultra-low ash and sulphur levels. Fluidized-bed combustion boilers, briquettes and pyritic-based sulphuric acid production and use in brickmaking can also help alleviate environmental problems resulting from coal-washing waste, while methane recovered from coal seams before mining can be used as a fuel for district heating and electricity generation.

8. The Clean Coal Demonstration Program of the United States Department of Energy is testing 39 full-scale demonstration projects of such technologies as circulating fluidized-bed combustors; pressurized fluidized-bed combustors; integrated gasification combined cycle systems; advanced slagging combustors; and a number of process technologies, such as gas suspension absorption, confined zone dispersion and limestone scrubbers. The first two phases of this multi-year programme have included 11 projects, with contributions of $279 million from the Government and $527 million from United States industries. 4/ Many of the newer clean-coal technologies are still in the demonstration phase and have yet to be commercialized.

9. Coal use in the industrial and utility sectors can be integrated with energy requirements in the domestic sector. For example, both gasified coal and methane-rich coke oven gas can be effectively used as town gas to replace direct coal combustion for residential heating and cooking. Similarly, process steam from electric utility and large industrial boilers can be used for district heating in the residential, commercial and institutional (for example, schools, hospitals) sectors.

10. Existing electric utility coal-fired boilers in many developing countries are relatively inefficient and have minimal environmental controls. High stacks, which disperse the pollution, merely exchange a local pollution problem for a regional or global one. Although modern coal-fired power plants are inefficient relative to cogeneration, leap-frogging to next-generation technologies may prove to be impractical due to front-end capital cost, risk and lack of appropriate skills. Any assessment of power-generating technologies based on efficiency, environment and cost must also take into consideration both the scope for upgrading conventional technologies through plant rehabilitation and fuel switching and load/demand management.

11. The consultative meetings of the Stockholm Initiative on Energy, Environment and Sustainable Development have stressed the importance of plant rehabilitation over capacity expansion, with an emphasis on recurrent funding for preventive maintenance and spare parts programmes; the selection and rewarding of qualified and motivated personnel; international guidelines for training and human resource development; and closer cooperation between utilities in developed and developing countries in order to transfer experience, analytical and operational systems and organizational structures. 5/

Management technologies

12. The application of least-cost planning approaches and demand management makes it possible to serve more consumers, either with the same amount of energy or without additional investment in power plants, through, for example, demand-reducing schemes, including information and consumer-level efficiency studies; enhancement of the efficiency, use and environmental characteristics of existing capacity; preferential purchase of electricity from private suppliers; and implementation of caps on emissions.

13. Proper organization and management of the workfloor, as well as regular equipment maintenance, can improve energy efficiency. The design of buildings with respect to lighting, space and air-conditioning is also important.

14. In developing countries, transportation accounts for the largest share of petroleum consumption, which shows a stronger growth than other energy forms. In 1987, transportation accounted for about 44 per cent of the total demand for petroleum products in the 12 largest oil-consuming developing countries. That share has increased in recent years as oil use in other sectors, such as electricity generation and industry, has been displaced by coal and other fuels. Of this amount, 60 to 80 per cent is consumed by vehicles. Moreover, motor vehicles in countries that are members of the Organisation for Economic Cooperation and Development are the dominant source of carbon monoxide, nitrogen oxide and unburned hydrocarbons. Improving the efficiency of transportation technology may achieve a 10-20 per cent savings of oil over the next two decades, but increasing attention must also be given to moving away from an oil-based transportation system. 6/

15. Both compressed natural gas and ethanol are used in some countries as fuels. Compressed natural gas appears to be an attractive option for countries with large natural gas reserves, but it requires costly front-end investments in pipelines and compression facilities as well as vehicle conversions. Ethanol is another major option but its market success is dependent on a high cost of oil; ethanol/gasoline blends reduce oil imports but are not competitive at current oil prices. With all alternative fuels, three issues must be addressed before introduction of the technology:

(a) A research and development programme must be in place to link development of vehicles or any other related technologies with the requirements of the fuel and to ensure that appropriate standards are enacted to protect the public;

(b) The utilities should take the leadership role for (and thus a major stake in) the innovation;

(c) Long-term planning must be recognized to be as critical as the short-term planning which has generally characterized the use of alternative fuels. 7/

16. The catalytic converter was introduced in 1975. Initially composed of oxidation catalysts, the three-way converter of the 1980s is capable of lowering carbon monoxide, hydrocarbon and nitrogen oxide emissions simultaneously but has little effect on carbon dioxide emissions.

17. Modal mixes of informal and formal transport, and of fuel-powered and people-powered transport, also deserve attention. For example, private, informal means of mass transit, such as jitneys and jeepneys, may serve as connectors between semi-rural areas and the main train/subway/bus lines into the cities. Two and three-wheeled bicycles can be used to transport people and light goods, particularly if encouraged through special bicycle lanes or designated side-roads.

18. One of the most important ways to increase energy efficiency is not through new technologies but through programmes promoting proper maintenance of existing vehicles on the road. This implies access to or fabrication of spare parts, technical knowledge and organization for inspections and servicing.

B. Energy-related technologies for the building sector

19. Lighting and heating requirements for commercial buildings constitute one of the fastest growing energy demand sectors, with implications for both commercial and household design and construction. Opportunities to increase efficiency include better heating, cooling and lighting equipment; appropriate use of energy controls; better insulation; more efficient building shells (for example, better windows); and use of reflective roof coatings, shading and natural light.

20. In the United States of America, for example, 28 per cent of total energy in commercial buildings and 7 per cent in households is used just for lighting; water heating accounts for 15 per cent of household and 4 per cent of commercial energy use; and food refrigeration and freezing use about 10 per cent of household energy and 5 per cent of commercial energy. Vastly improved technologies are available in all three areas, and a considerable potential for further improvement remains. 8/

C. New and renewable energy technologies

21. The majority of households in developing countries, however, are not connected to an electric grid. Energy is needed but most commercialized forms are not available. There are an increasing number of promising technologies which lend themselves to the "disconnected", including technologies for the combustion of biomass (particularly of agricultural residues), the anaerobic production of biogas and the production of alternative fuels.

22. Considerable attention is also being given to improved solar, wind and water-powered technologies. Innovations in solar energy technologies are available for heating, drying, water treatment, refrigeration and cooling, cooking, water pumping and thermal and photovoltaic electric power generation. Photovoltaic energy, in particular, has witnessed significant growth in application, as a result of advances in materials science and related fields. Large-scale photovoltaic applications, including those for grid connections, have also increased substantially in recent years. 9/ At present, the world's largest rural electrification programme using photovoltaics is being implemented in Mexico as a part of that country's rural electrification strategy. 10/

23. Unfortunately, most solar-based applications lack world-wide commercialization due to a combination of high initial investment and small markets; heavily subsidized energy prices in many countries; the poor quality and design of many of the technologies; the shortage of techno-economic studies, information dissemination and promotion; and the lack of a meaningful market research and commercialization strategy. 11/

24. Mini and micro-hydro plants are already in operation throughout the developing world, while new designs for wind turbines, capable of harnessing wind energy for household and agricultural electricity, water pumping and even distribution through the grid, are on the market and under development. The use of hydrogen for heat generation, fuel and direct electricity production using fuel cells is also being researched and developed.

II. POLICY ISSUES AND OPTIONS FOR THE EFFECTIVE TRANSFER AND APPLICATION OF ENVIRONMENTALLY SOUND ENERGY TECHNOLOGIES

25. Domestic market policies, capacity-building requirements and technology transfer policies are interrelated elements to be considered in the formulation of strategies and programmes for the effective transfer and application of environmentally sound energy technologies in developing countries.

26. Several policy instruments that have been used successfully in some countries are illustrated. However, it is not possible to determine which of these policies, singly or in combination, should be implemented, since the effect of any policy is widely influenced by other economic, political and social variables. Prescriptions require a case-by-case approach.

A. Domestic market policies

Consumer awareness

27. A number of policies designed to influence the behaviour of consumers by keeping them informed have been adopted by developing countries, including the use of energy efficiency stickers on appropriate consumer items (for example, automobiles and electric appliances) and disseminating information through both print and electronic media. These programmes are important and should be encouraged, but recent studies have indicated that they are not likely to be permanently effective if used alone.

28. For example, PROCEL, the conservation programme of Electrobras in Brazil, has undertaken studies of demand; held seminars, training and media campaigns on energy conservation technologies; funded the relamping of street lights with high-pressure sodium bulbs; conducted research on appliance efficiency; and sponsored demonstration projects in industrial cogeneration and conservation in commercial and public buildings. 12/

29. One study in the United States concluded that in many cases, it has proven to be far easier and more effective to remove or discourage inefficient products from the market, rather than to try to educate consumers on how to make

individual energy purchase decisions. Indeed, energy standards result in more savings than other methods, including tax credits, rebates and consumer education. 13/

30. Similar conclusions were drawn in Brazil, where it was found that there is little to be done with respect to the way the customers operate their appliances. Most of the work in energy conservation, the authors of one study stated, should be directed to improving the efficiency of the equipment itself and ensuring good marketing and financial backing in order to have efficient equipment reach the homes of the majority of the population. 14/

31. A third study on energy savings in Denmark between 1972 and 1988 found that most of the changes in energy efficiency were caused by permanent changes in technology, not temporary changes in behaviour. The relationship between behaviour and utilization is volatile and subject to rapid swings, caused by changes in prices or incomes or by other factors. 15/

32. The Energy Conservation and Efficiency Project in Egypt has as its primary objective the completion of 60 industrial conservation technology demonstrations in eight years. At the same time, it has supported programmes in energy conservation training and in the implementation of conservation technologies. 16/

33. Consumers, businesses and industry must all be made aware of the need to use and produce energy-efficient technologies. This may be achieved through awareness programmes, such as the above-mentioned programmes, through regulations and other government programmes, discussed in the present section of this report and through information dissemination, discussed in the last section of this report. In addition, support for research and development to ensure the availability of appropriate technologies must exist parallel to other programmes.

Taxes and regulations

34. Among European countries, Denmark, Finland, the Netherlands, Norway and Sweden have implemented carbon taxes (with some exceptions for carbon-intensive industries). Other countries have implicit carbon taxes. The European Community as a whole has agreed to a regional target and the Commission of the European Communities has proposed a community-wide energy-carbon (50:50) tax to reach $10/bbl ($42/ton carbon for the carbon component of the tax) by 2000. 17/

35. Carbon and other energy-related taxes can be used as efficiency-inducing measures in reducing energy intensity (the ratio of energy consumption to gross domestic product). A secondary target may be the raising of funds for new capital investment.

36. An alternative approach is based on tradeable permits, which place a cap on specific air pollution emissions in a geographic region. Industries are initially assigned individual ceilings or caps; those that control emissions under this cap may sell their rights to the remaining portion to another industry that wants or needs to maintain a level of pollution that exceeds the cap. These permits differ from taxes in at least two important ways: they directly affect only industry (although presumably consumers are indirectly

taxed by higher production costs) and they target a national level of environmental tolerance, not an individual level.

37. Taxes and tradeable permits work by levying a financial penalty against the excessive polluter, by trying to alter behaviour and by providing an incentive to invest in new, more energy-efficient technologies. If the demand for new technologies increases, their development and commercialization is more likely to follow in response.

Subsidies

38. Taxes increase the cost of using energy. However, in many developing countries, the opposite situation prevails: energy, particularly electricity, is highly subsidized. This policy of subsidization is rational from a political, social and humanitarian point of view in the short run. None the less, subsidies generally entail not only immediate economic and environmental costs but also long-term social costs.

39. At the same time, policies are needed which will introduce new technologies as subsidies are removed.

Cash rebates and incentives

40. Some developed countries, including the United States of America, Canada and Sweden, have established a "golden carrot programme", to promote development of technologies that exceed established standards of energy efficiency. This is accomplished in two ways. The first is through the provision of cash rebates to a large but fixed number of first purchasers of products in order to help ensure a sufficiently large volume of sales and market penetration. While this, in effect, may constitute a subsidy, it is not meant to make energy cheap but to help a new technology penetrate the market.

41. The second component of a "golden carrot" comprises large cash incentives to producers to offset incremental manufacturing costs. Such funds are often raised through consortia of utility manufacturers and other stakeholders. 18/

42. Still another incentive is the "freebate" for whole buildings, appliances and automobiles. For example, operating in a manner which exceeded a targeted energy use, as in the case of tradeable permits, would require owners of buildings to pay a fee. This fee would then be rebated to owners of buildings or technologies which used energy below the target, with a small portion withheld to support the administrative costs of the system. 19/

New technologies and fuel substitution

43. The present report has argued that support for new technologies in combination with fuel substitution is the single most important policy for promoting the commercialization of energy-efficient technologies. This conclusion has been confirmed by a number of studies undertaken in widely divergent countries. The Organisation for Economic Cooperation and Development (OECD) has concluded that assumptions about costs and the effectiveness of carbon taxes depend to a large extent on the availability, introduction and rate of market penetration of efficient technologies and other clean-energy

equipment. 20/ The OECD study concluded that fuel diversification or substitutability is key to reducing cost, or the level of tax required; backstop or low/no carbon technologies are critical; and eliminating fossil fuel price subsidies world wide would significantly reduce CO_2 emissions with net social benefit. 21/

44. This means that both public and private stakeholders need to support the research, development and demonstration of new energy-efficient technologies, as well as measures to encourage their penetration into the market which will require both imagination and financing. Funding for these activities may come from bilateral or multilateral agencies, including regional development banks; from private capital markets, including commercial lenders such as banks and insurance companies, the largest providers of senior and often syndicated debt; from pools of invested capital, such as pension funds and private investment funds; and from commercial sponsors. 22/

45. Funds can also be generated within the country. This often requires the creation of consortia of public and private interests, including government officials, industrialists, bankers and other businessmen.

46. In Argentina, for example, the Associación Argentina para el Uso Racional de la Energía, a non-profit business association, not only provides technical energy information to industrial and agricultural energy users but also helps draft legislation to promote alternative energy sources and fuel substitution and reduce taxes on energy-efficient equipment. 23/

47. In 1986, the Government of Tunisia created the Agence de Maîtrise de l'Énergie with a broad mandate to pursue conservation and renewable energy resource opportunities in all sectors. Audits sponsored by the Agency are provided by private engineering firms, which are reimbursed for 50 per cent of the cost of the audit. Upon completion of the audit, each company enters into a five-year contract with the Agency that specifies how the company will implement the recommendations. In exchange, the Agency funds 50 per cent of the cost of any audit-recommended training programme and 50 per cent of the cost of any pre-feasibility studies needed prior to investment in advanced efficiency improvements. Companies are also eligible for low-interest loans and are given various tax incentives. Initially, the Government funded these assistance programmes in part from a tax on fuel oil and gasoline. Financial assistance now comes directly from the Government's general funds.

48. The Agency is also supporting the creation of domestic firms for the joint-venture manufacture of insulation, high-efficiency lamps, air-conditioners and boilers for small businesses. It holds monthly meetings with the relevant industries to inform them of high-efficiency technologies and of overseas companies with whom they might form joint ventures and it is building a database of high-efficiency technologies relevant to Tunisia. 24/

49. The Energy Conservation and Efficiency Project of Egypt, discussed in paragraph 32 above, is undertaking 60 industrial conservation technology demonstrations in eight years. Rather than concentrating on any single plant or only a few plants, it identifies in each plant four areas where efficiency improvements are needed, funds one of them and recommends that the company fund the other three. 25/

50. China has organized support for the China Energy Conservation Company of the State Energy Investment Corporation. Funds are given to companies for both employing proven technologies and for demonstrating new technologies. The Company normally provides one third of a project's cost through a direct grant. Some additional funds come from federal ministries or local and provincial governments, but the primary funding comes from individual companies. 26/

51. Finally, one of the most recent examples of State support for energy-efficient technology is provided by Thailand, whose legislature has just approved legislation establishing the Energy Conservation Promotion Fund. With projected first-year appropriations of 1.5 billion baht ($60 million), the Fund may become the largest fund investing in energy efficiency and renewable energy of any nation in the world. Individuals, businesses, non-governmental organizations, government agencies and State enterprises may apply for grants to finance projects. Grants may be used for education, promotion, demonstration, monitoring, research and development, and policy and planning. The Fund has derived its money from three sources: the now defunct Petroleum Price Stabilization Fund, a levy on petroleum and natural gas refinery products and funds received from the local private sector and external lenders. 27/

Information

52. There is a need for policies to organize information on energy-efficient technologies in such a way as to make it accessible and relevant to all potential users. This is a critical requirement, which all of the national bodies, both public and private, discussed in the present report, as well as many other such organizations, are trying to satisfy.

53. The series of conferences on clean-coal technologies sponsored by the Department of Economic and Social Development stressed the usefulness of regional centres as a forum in which suppliers and recipients of technologies could exchange valuable technical information. 28/

54. The International Energy Agency of OECD has pointed out that the lack of reliable information in most countries on the breakdown of energy demand, the availability, costs and potential of efficient technologies and their efficiencies relative to current stock begs the question: if Governments do not know where they are today, how will they be able to monitor and measure their progress in the application of this policy tool? 29/

B. Capacity-building

55. If countries are to be able to successfully choose, adapt, absorb and manage the new technologies they acquire externally or generate internally, it will be necessary to develop and strengthen the institutions that make this possible. These institutions are clearly influenced by policy and regulation, which must provide an enabling environment in which they can develop.

56. The development of enabling environments and individual institutions on the scale of a sector or subsector is called capacity-building. Capacity-building thus involves development of institutions, their managerial systems and their human resources, which in turn require favourable policy environments.

Capacity-building in the energy sector is important for the successful transfer of environmentally sound energy technologies.

57. There are several areas of capacity-building which are necessary to achieve virtually any objective, including the commercialization and transfer of environmentally sound energy technologies. Of particular importance, however, are policy analysis and planning; organization; human resource development, with particular emphasis on managerial training; information; and technology assessment.

58. It is especially important that organizations, even those established as entities of a central Government, work only when they have strong linkages with industry and research and development, and where training has been implicit throughout. Those involved must be conversant with energy audits and their implementation; they must be able to understand the connection between energy efficiency and development goals; they must be able to work with new technologies and to organize themselves on the shop floor to be energy-efficient. This demands strong management capabilities. The United Nations Educational, Scientific and Cultural Organization has consistently provided training courses in these areas. 30/

59. The need for well organized and accessible information on new energy technologies has been discussed in paragraphs 52-54 above and will be discussed in more detail in paragraphs 83-94 below.

60. Technology assessment conjures up images of large, well staffed organizations with sophisticated methodologies employing sophisticated equipment and sophisticated people. Only the last need be true. A technology assessment capability may be a single large or small organization; it may be the nucleus of a larger agency; or it may be a network or consortium of organizations involved in research, development, demonstration, information, policy, planning and industry. It may employ computer models for assessment, or it may rely on dialogue with relevant stakeholders. Most likely it will do both, but neither computers nor modelling are necessary.

61. All capabilities for good technology assessment have the following in common: a method to identify a technology-related issue or question; access to relevant information internationally; access to those affected by the technology, whether suppliers, industrial/commercial users, consumers or the financial community; a capacity to analyse and value a number of variables; and access to decision makers.

62. What variables does technology assessment measure and weigh? It looks at the comparative economic, social, environmental and political costs of a technology or group of technologies. In the absence of complete information and this kind of analysis, it will be difficult for any country to choose and commercialize environmentally sound energy technologies wisely.

63. National capacities for technology assessment may be strengthened and enriched through a number of international programmes, such as the Advanced Technology Assessment System (ATAS) of the United Nations Department of Economic and Social Development and appropriate non-governmental organizations. Other entities which could assist national efforts include the proposed International

Association of Technology Assessment Institutions, 31/ as well as, on a sectoral basis, the proposed Regional Clean-Coal Centres, the International Centre for Hydrogen Energy Technology and the International Centre for the Advancement of Solar Energy. 32/

C. Technology-transfer policies

64. Besides multilateral or bilateral technical assistance, developing countries can gain access to technology by a series of mechanisms, such as the importation of capital goods, foreign direct investment and by obtaining licenses. Foreign direct investment, in particular, with its many variations, offers new know-how in the production process, management and marketing. Joint ventures are also a way of combining foreign investment and technology transfer. Industry itself decides where to invest, but Governments in developing countries can influence the behaviour of companies to a certain extent by liberalizing the investment climate. Transparency and stability of regulations are important in this respect.

65. Foreign investment will of course occur in sectors in which developing countries have a comparative advantage. Research shows that the per capita volume of foreign investment is greater in countries with an outward-looking policy. Therefore, private capital markets are more available to a strong sponsor with a track record for completing projects on time and for working with suppliers and bankers; a practicable economic need, with long-lived, strong, stable demand; ready availability of supplies, raw materials and equipment; a relatively advanced legal system; and a politically and economically stable host Government, willing to cooperate. 33/

66. An overview of some of the options that facilitate the transfer of energy technologies to developing countries is presented below. Each country should assess the advantages and disadvantages of the application of these mechanisms, taking into account their economic, social, environmental and political effects. 34/

67. Tax incentives for environmental goals. These could be a useful economic policy instrument. The particular tax incentives could take various economic policy forms, including elimination or reduction of foreign investment and sales taxes, deferred taxes, tax holidays and graded taxation according to the level of environmental good achieved. Deferred taxes would give an investing company a tax break for a period of time if, for example, it intended to install more efficient or cleaner technologies during that period. Tax holidays could be based on sectors of industry with environmental priorities.

68. Tariff incentives for environmentally sound technologies. Such incentives could be a direct means for increasing the transfer and use of these technologies. Under a system of liberalized tariffs, an importing developing country would waive or substantially reduce import tariffs to those firms importing or using environmentally sound technologies in their local operations. Problems of both cost and accessibility would be lessened through a reduced tariff system.

69. Relaxation of income repatriation. This could be permitted if, for example, the foreign company was willing to invest in the transfer, use or production of clean energy technologies in the host country. Such a measure would not be likely to accomplish much by itself but could be effective in concert with other incentives.

70. Global revenue. Offset investment programmes constitute a policy option, particularly for developed countries. In these programmes, a developed country could forgo a domestic investment in environmentally sound energy technologies in order to finance a similar but more cost-effective programme in another country whose harmful technologies undermine the anti-pollution efforts of the developed country. For example, the Governments of Finland, Norway and Sweden are engaged in an effort to modernize Russian nickel smelters. The objective is to reduce sulphur dioxide emissions in each of their respective countries from 250,000 tons/year to just over 30,000 tons/year.

71. Multilateral official development assistance programmes. Most multilateral development agencies have been building environmental concerns into the planning, budget allocation, implementation and assessment of their work. There are also several new programmes to support the commercialization and transfer of environmentally sound energy technologies. Two major institutions involved in energy conservation in Hungary, the Energy Supervision Institute and the National Bank of Hungary, have been administering an industrial energy conservation loan programme since 1983. The National Bank receives funds from the World Bank which it then lends, as needed, to a network of about 20 commercial banks, who disperse the funds to industrial borrowers. The National Bank provides funds to the commercial banks for a 12-year term and commercial banks provide the same terms to industrial borrowers. The funds, in the form of hard currency, allow companies to purchase imported equipment, among other things. 35/

Sources of financing and other assistance for technology transfer

(a) Financing

72. The Department of Economic and Social Development of the United Nations Secretariat, working with key decision makers in Government and industry, heads of major developing country utilities and representatives from bilateral and multilateral organizations, instituted the Stockholm Initiative on Energy, Environment and Sustainable Development. This body places particular emphasis on power plant rehabilitation, that is, on making existing plants more efficient. To achieve this, it will work towards creating financing mechanisms to support joint ventures between developing and industrialized countries in efficient and environmentally sound energy technology development and commercialization. It will strengthen global energy and environmental management networks of bilateral and multilateral donor organizations, and relevant institutions in developing countries.

73. The Economic Commission for Europe has proposed two major programmes to promote information exchange, commercialization and the transfer of energy technologies. The first is entitled "Energy Efficiency 2000" and is directed towards trade and cooperation in energy-efficient environmentally sound

technologies and management practices between the economies in transition of Central and Eastern Europe and the market economies of Western Europe and North America. The second proposal relates to similar cooperation between the five regional commissions of the United Nations and is entitled Global Energy Efficiency 21.

74. Probably the best known and best funded new source of financing for environmentally sound technologies, including energy technologies, is the Global Environment Facility. Established in 1990 as a three-year pilot programme, it provides funding for investments and technical assistance in four focal areas: global warming, biodiversity, international waters and ozone depletion.

75. The United Nations Development Programme has established a programme entitled "Capacity 21" to redirect its activities consistent with the principles of sustainable development. It intends to "provide leadership in integrating environment and development and in capacity-building" and to serve as a channel for new and additional resources. 36/

76. The Global Energy Efficiency Initiative, launched in 1990 by a coalition of organizations in the public and private sectors of the United States of America, has three major goals: (a) to develop constituencies in developed countries to support broad-scale energy-efficiency strategies in developing countries and countries whose economies are in transition; (b) to promote a coordinated donor agency strategy; and (c) to foster a constituency for energy efficiency within those countries. The body is in the process of establishing national working groups.

Bilateral donors

77. Bilateral donors continue to be a source of financing for the transfer of environmentally sound energy technologies. A number of developed countries are initiating special programmes in support of this objective. An interesting example is the programme supported by the United States Agency for International Development, the Program for the Advancement of Commercial Technology (PACT), which was established in the 1980s with the goal of accelerating the pace and quality of technological innovation in products and processes in India. Administered by the Industrial Credit and Investment Corporation of India, which also provided some of the investment capital, PACT provides grants to support up to 50 per cent of the costs of India-United States of America joint-venture research and to develop projects for commercial application. Based on the success of this programme, the Agency recently initiated a second programme, the Program for Commercial Energy Research, with a budget of $20 million. 37/

78. None the less, the greatest sources of funds continue to be private capital markets.

(b) Other assistance for technology transfer

Commercial contracts

79. Technology transfer occurs through commercial contracts. The primary sources of environmental technology are corporations in developed countries and transnational corporations, which typically sell to developing countries. The State usually negotiates entry contracts and thus acts as a gatekeeper in all technology transfer arrangements.

80. Transfer occurs through turnkey plants, licensing arrangements, wholly owned subsidiaries of transnational corporation parent companies or joint ventures. In addition, some technology transfer occurs through more informal channels and outside of markets. Purchasers may learn of new technologies through personal contacts, meetings and trade fairs, for example, and either seek to purchase the technology or to reproduce it without patent rights.

81. However, many of the more sophisticated technologies are not yet in the public domain and remain the intellectual property of transnational corporations. In addition to the barriers posed by a lack of sufficient institutional capacity, two fundamental bottlenecks are a lack of sufficient information regarding the environmentally sound energy technologies and the shortage of capital available for purchasing mature technologies. 38/

82. In an article in the ATAS Bulletin, the author suggests that "technology transfers can be financed creatively to minimize their costs for developing countries". Since technology is "intellectual property with fungible characteristics", it can be bartered or traded, even for third world debt. 39/

Information

83. Countries need reliable, impartial information on available products and processes, including detailed descriptions of technologies, real-world examples of how they are applied, projected energy savings, range of costs, how to get access to the product and bibliographies on specific technologies. Most existing databases are not geared to the needs of developing countries and are often not even accessible to users in developing countries. Those that are available tend to be biased towards so-called appropriate technologies, that is, those that are small-scale, labour-intensive and require low capital investment.

84. The Department of Economic and Social Development provides information on various environmentally sound energy technologies through workshops, publications and training seminars and through its Advanced Technology Assessment System (ATAS). As mentioned in paragraph 63 above, the Department is also working to establish a Regional Clean-Coal Centre in the Asia and Pacific region to serve as a link between users and suppliers.

85. The Economic Commission for Africa publishes material and organizes workshops, particularly in the area of new and renewable sources of energy. A new publication, entitled Potential Contribution of New and Renewable Sources of Energy to the African Energy Supply, is based on a questionnaire which was sent to all African Member States in order to collect updated data on development and the use of renewable sources of energy and on local companies involved in

importing and/or manufacturing renewable energy systems. 40/ The Economic and Social Commission for Asia and the Pacific has published material evaluating photovoltaic systems for rural application, for training in electricity conservation in commercial and domestic subsectors and for training in energy management. It has also held meetings and exhibitions on wind energy and planning in the area of renewable energy. 41/ The Economic Commission for Europe is promoting information exchange through its proposed programmes, Energy Efficiency 2000 and Global Energy Efficiency 21. 42/

86. The United Nations Development Programme (UNDP) is establishing a Sustainable Development Network in order to facilitate freer and more rapid access to information for users in developing countries; to encourage increased communication about sustainable development; and to enhance the capacity of national institutions to meet their own needs for information and to participate in the Network.

87. The Food and Agriculture Organization of the United Nations provides information relating to a comprehensive policy framework for rural energy problems. Special attention is being given to information concerning biomass energy conversion, energy efficiency and solar and wind technologies. 43/

88. The United Nations Educational, Scientific and Cultural Organization is developing an Energy Knowledge Bank, part of which is an existing on-line referral database, ENERGY, which contains information on 5,000 research and information institutions involved in new and renewable sources of energy, as well as government agencies, trade and professional associations, training institutions, networks and others. 44/

89. The United Nations Industrial Development Organization has established the Technological Information Exchange System, a cooperative network of information and data exchange among developing countries on subjects related to technology transfer. Its Technical Advisory Services programme provides advice on all aspects of the technology acquisition process and its Investment Promotion Service, helps to identify foreign partners for sponsoring investment projects. Finally, the proposed International Centre for Hydrogen Energy Technology and the Centre for the Advancement of Solar Energy will also serve as both major sources of information and mechanisms for demonstration and commercialization.

90. Lund University in Sweden has developed The Technology Menu for Efficient End-Use of Energy. It is designed as a first-stop information resource for a broad range of energy decision makers. It presents technology descriptions, technical and cost data and illustrative economic analyses, with an emphasis on advanced technology and advances in existing technologies.

91. The International Institute for Energy Conservation (IIEC), a non-governmental organization based in Washington, D.C., has developed a Technical Information Directory, which lists organizations that provide technical information on energy-saving technologies. IIEC is also developing a database of information on the latest and most effective energy conservation policies from the industrialized world. Called the Policy Information Project, it is concentrating on four major policy areas: integrated resources planning and demand-side management; buildings; appliance labelling and standards; and transportation.

92. The International Energy Initiative was established in September 1991 by an international consortium to operate as a small, southern-led, independent and international non-governmental organization to promote the efficient production and use of energy for sustainable development. Activities include information exchange, training, analysis, advocacy and action.

Intellectual property rights

93. A pilot project on transfer of patent rights to an intermediary international organization is under way within UNDP. Called the Technology Rights Bank, it focuses on patent rights for new technologies in general rather than exclusively on environmentally sound technologies.

94. The World Intellectual Property Organization provides advice to Governments, at their request, on drafting appropriate laws and regulations for intellectual property rights. It is also available to provide training in developing countries on the transfer of environmentally sound technology that is protected as intellectual property. 45/

III. CONCLUSIONS

95. A number of clean technologies for all end-uses are ready for the market and still more are in research or are undergoing demonstration at this time.

96. The developed countries should increasingly target assistance to finance both demonstration and development of energy technologies in developing countries through bilateral and multilateral channels. This includes extending their own national demonstration and development programmes to include demonstration in other countries.

97. The developed countries should also provide lists of product and service vendors and make them available in developing countries, and should organize briefings for companies when specific opportunities arise on field trade missions and help to meet the financing and insurance needs of energy-efficiency vendors working in developing countries. Energy export trading companies, with the requisite expertise, could be established. 46/

98. The developing countries should create better policy environments for investment in energy-efficient goods and services and invite trade missions to explore import potential. Additionally, they should focus their efforts on strengthening the capacities they need to develop, adapt and commercialize environmentally sound energy technologies and to explore financial resources which could support the commercialization of such technologies in their own countries.

99. Developed and developing countries and countries whose economies are in transition should jointly establish research and development strategies for the generation, transfer and effective use of environmentally sound energy technology for the benefit of developing countries, including the provision of resources needed for the demonstration and commercialization of such technologies. International networks of power utilities and centres for the

exchange of information between users and suppliers would greatly contribute to cooperation and capacity-building.

Notes

1/ The Economic and Social Council, in decision 1992/218 of 30 April 1992, in which it recalled General Assembly resolution 46/235 of 15 April 1992 on the restructuring and revitalization of the United Nations in the economic, social and related fields, decided, inter alia, to establish a functional Commission on Science and Technology for Development, transformed from the Intergovernmental Committee on Science and Technology for Development and its subsidiary body the Advisory Committee on Science and Technology for Development.

2/ The functions previously carried out by the Centre for Science and Technology for Development have now been assumed by the Science, Technology, Energy, Environment and Natural Resources Division of the newly established Department of Economic and Social Development.

3/ See the following reports: (a) International Conference on Environmentally Sound Coal Technologies: Policy Issues and Options, Beijing, 2-6 December 1991, jointly organized by the Centre for Science and Technology for Development of the United Nations Secretariat and the State Science and Technology Commission of China; (b) International Conference on Environmentally Sound Coal Technologies: Policy Issues and Options, Madras, 15-18 January 1992, jointly organized by the Centre for Science and Technology for Development, the Ministry of Environment and Forests of the Government of India, the M. S. Swaminathan Research Foundation and Ana University, Madras; and (c) International Round Table on Environmentally Sound Coal Technologies: Policy Issues and Options, Berlin, 12-15 May 1992, jointly organized by the German Foundation for International Development (DSE) and the United Nations Department of Economic and Social Development (Berlin, DSE, 1992).

4/ C. B. Szpunar and J. L. Gillette, Comparative Analyses for Selected Clean Coal Technologies in the International Marketplace, report (ANL/EAIS/TM-39) prepared by the Environmental Assessment and Information Sciences Division, Argonne National Laboratory (Argonne, Illinois, July 1990), p. 176. See also E. Lowell Miller, "The clean coal initiative: an appropriate response to complex environmental issues", paper presented at the Conference on Coal and the Environment: Asia 2010, Honolulu, 11 and 12 July 1991.

5/ Michael Willingham, "Strategies for implementing power sector efficiency", paper prepared for the Consultative Meeting, Stockholm Initiative on Energy, Environment and Sustainable Development (SEED)", 13-15 November 1991.

6/ Jayant Sathaye and Stephen Meyers, "Transport energy use in developing countries", ATAS Bulletin: Energy Systems, Environment and Development, Issue 6 (United Nations publication, Sales No. E.91.II.A.4), pp. 323-329. See also the introduction to section 6, "Technology for transportation demand", in ibid., pp. 315-319.

7/ Bernard A. James, "Alternative vehicle fuels: the Canadian experience", ATAS Bulletin: Energy Systems, Environment and Development, Issue 6 (United Nations publication, Sales No. E.91.II.A.4), pp. 376-381. See also, in ibid., Jorge A. Doma, "Substitution of compressed natural gas for petroleum fuels in Argentina", pp. 382-383; Lourival Carmo Monaco, "Ethanol as alternative transportation fuel in Brazil", pp. 384-396; and Mohamed L. Baraka, "The Kenyan experience with ethanol for transportation", pp. 397-399.

8/ United States Congress, Office of Technology Assessment, Building Energy Efficiency (Washington, D.C., United States Government Printing Office, May 1992), pp. 50-60.

9/ ATAS Bulletin: Prospects for Photovoltaics: Commercialization, Mass Production and Application for Development, Issue 9 (United Nations publication, Sales No. E.92.II.A.14), p. vi.

10/ Ibid., p. 5.

11/ O. A. El-Kholy and H. Sharon, "The establishment of a Centre for Applications of Solar Energy (CASE): a draft feasibility report", prepared for the United Nations Industrial Development Organization, July 1991, p. 7.

12/ Michael Philips, Energy Conservation Activities in Latin America and the Caribbean (Washington, D.C., International Institute for Energy Conservation, 1990), pp. 2-4.

13/ Ashok Gadgil, Arthur H. Rosenfeld and Lynn Price, "Making the market right for environmentally sound energy-efficient technologies: United States buildings sector successes that might work in developing countries and Eastern Europe", paper presented at ESETT'91: International Symposium on Environmentally Sound Energy Technologies and their Transfer to Developing Countries and European Economies in Transition, Milan, Italy, 21-25 October 1991, pp. 5-7.

14/ Gilberto De Martino Jannuzzi and others, "A critical look at residential electricity conservation campaigns in a developing country environment", unpublished paper, p. 3.

15/ Lee Schipper and others, "Energy use in Denmark: an international perspective", unpublished paper, October 1992.

16/ Michael Philips, Energy Conservation Activities in Africa and Eastern Europe (Washington, D.C., International Institute for Energy Conservation, 1990), pp. 10-12.

17/ Robert G. Skinner, "World energy future: the demand side challenge", paper prepared on behalf of the International Energy Agency of the Organisation for Economic Cooperation and Development and presented to the 9th International Symposium on Petroleum Economics, Quebec, October 1992, p. 6.

18/ Gadgil et al., op. cit., p. 7.

19/ Ibid., p. 8.

20/ Skinner, op. cit., p. 16.

21/ Ibid.

22/ Daniel A. Roling, "Financing energy projects", paper presented on behalf of Merrill Lynch Capital Markets at the Conference on Coal and the Environment: Asia 2010, Honolulu, 11-12 July 1991, p. 12.

23/ Philips, Energy Conservation Activities in Latin America and the Caribbean ..., p. 13.

24/ Philips, Energy Conservation Activities in Africa and Eastern Europe ..., pp. 7-9.

25/ Ibid., p. 11.

26/ Michael Philips, Energy Conservation Activities in Asia (Washington, D.C., International Institute for Energy Conservation, 1991), p. 3.

27/ International Institute for Energy Conservation, Demand Side Management for Thailand's Electric Power System: Five Year Master Plan (Washington, D.C., November 1991).

28/ International Round Table on Environmentally Sound Coal Technologies: Policy Issues and Options, Berlin, 12-15 May 1992, report of the Chairman, p. 14.

29/ Skinner, op. cit., p. 17.

30/ United Nations Educational, Scientific and Cultural Organization, "Energy for sustainable development and environmental protection" (UNESCO/SC/EST/92), pp. 7-9.

31/ The Science and Technology Branch of the Science, Technology, Energy, Environment and Natural Resources Division of the United Nations Department of Economic and Social Development is working with a number of technology assessment institutions world wide to help them establish a new international non-governmental organization to deal with technology assessment. A database, which has been compiled as a part of the Network of the Advanced Technology Assessment System (ATAS) will be made available to this new organization upon its creation.

32/ International Round Table on Environmentally Sound Coal Technologies: Policy Issues and Options, Berlin, 12-15 May 1992, report of the Chairman.

The United Nations Industrial Development Organization has proposed the creation of two of these centres, for hydrogen energy technology and solar energy. See El-Kholy and Sharan, op. cit.

33/ Roling, op. cit., pp. 8-10.

34/ Large parts of the material in the sections on tax and tariff incentives, income repatriation, global revenue and official development

assistance are taken from draft papers prepared by the former United Nations Centre on Transnational Corporations, entitled: "Options to facilitate transfer of environmentally sound technologies to developing countries on favourable terms" (July 1991). These papers are currently undergoing revision and will be published at a later date.

35/ Philips, Energy Conservation Activities in Africa and Eastern Europe ..., pp. 15-16.

36/ United Nations Development Programme, report of the Workshop on the Sustainable Development Network, New York, 8-10 September 1992, p. 9.

37/ Debbie Bleviss, "Focus on technology cooperation in energy efficiency", in World Resources, 1992-93, (New York and Oxford, Oxford University Press, 1992), p. 156.

38/ Peter M. Haas, "Greenhouse warming, technology cooperation and developing country concerns", paper prepared for the Office of Global Change of the Bureau of Oceans, Environment and International Scientific Cooperation, United States Department of State, May 1992.

39/ Juan R. Zarco, "Creative financial techniques for technology transfer to less developed countries", ATAS Bulletin: Environmentally Sound Technology for Sustainable Development, Issue 7 (United Nations publication, Sales No. E.92.II.A.6), pp. 181-187. See also report of the Workshop on Creative Financing for Environmentally Sound Technologies, organized by the Centre for Science and Technology for Development, Belém, Brazil, 2-7 December 1990.

40/ Letter from Peter N. Mwanza, Chief, Natural Resources Division, Economic Commission for Africa, 26 October 1992.

41/ Letter from M. Rahmatullah, Acting Chief, Division of Industry, Human Settlements and Environment, Economic and Social Commission for Asia and the Pacific, 11 September 1992.

42/ Letter, with enclosures, from John A. Kennerley, Deputy Director, Industry and Technology Division, Economic Commission for Europe, 26 October 1992.

43/ Letter from Gustavo Best, Senior Energy Coordinator, Research and Technology Development Division, Food and Agriculture Organization of the United Nations, 28 October 1992.

44/ United Nations Educational, Scientific and Cultural Organization, op. cit., pp. 4-6.

45/ Letter from Khamis Suedi, Director, Bureau for Relations with International Organizations, World Intellectual Property Organization, 7 September 1992.

46/ Bleviss, loc. cit., pp. 155-156.

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FINANCING SCIENCE AND TECHNOLOGY FOR DEVELOPMENT, INCLUDING ACTIVITIES OF THE UNITED NATIONS FUND FOR SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

Organization of a coalition of resources to finance science and technology for development

Report of the Secretary-General

SUMMARY

A major issue facing the international community in the field of science and technology is how to ensure the flow of adequate resources, especially financial resources, into developing countries, in order to support the creation and strengthening of their endogenous scientific and technological capacities as a crucial input into harnessing science and technology for development. This has been an issue on the agenda of the United Nations since the early 1980s, particularly in the context of the agreement reached at the United Nations Conference on Science and Technology for Development to create a separate and self-sustaining financing system for science and technology. Strenuous efforts over several years, involving expert groups, special emissaries and international negotiations, have not been able to fulfil the high expectations of the international community, especially the developing countries.

The General Assembly, while commemorating the tenth anniversary of the adoption of the Vienna Programme of Action on Science and Technology for Development, agreed to adopt a different approach. Instead of continuing to attract donor support to a financial system or a fund, it decided to explore the possibility of organizing a more effective coalition of resources. Such a

* E/CN.16/1993/1.

coalition should be drawn from a variety of sources, including bilateral and multilateral funding bodies which are willing to participate and prepared to contribute voluntarily, while retaining some measure of control over how funds are utilized.

The present report is intended to assist the Commission in formulating concrete proposals for organizing a more effective coalition of resources to meet the scientific and technological needs of developing countries, as requested by the General Assembly in resolution 46/165. The report addresses the questions of how a coalition of resources could be built, how it should function and how to attract funds for it from international funding bodies, donor countries and other potential partners. It deals with the global economic situation, the substantive setting, lessons to be learned from past efforts, basic assumptions to be noted and alternative models and their structures and modes of operation.

One alternative would be to establish a mechanism that would facilitate, among interested donors and participants, information exchange, policy coordination and the creation of guidelines to assist individual partners in carrying on with their separate activities.

A second alternative would be to establish an international association/council for science and technology. The association/council would meet periodically to mobilize resources and an executive board would manage and allocate funds to specific endogenous capacity-building projects. The association/council would be supported by the United Nations Secretariat and the United Nations Fund for Science and Technology for Development (UNFSTD), and would appraise projects submitted by developing countries.

However, some important details need to be worked out. For example, what should be the criteria for judging the viability of the association/council? Should it be based on a cut-off level, a critical mass of funds or a minimum number of partners and should these include any make-or-break organizations? How should resources be utilized in a manner that would allow contributors to retain some measure of control? What should be the modalities through which domestic resources are organically integrated with external resources and should there be any minimum domestic contribution? Should the contributions of developing countries, particularly low-income countries, be in kind or only in cost? Should the association/council attempt to attract funds from the private sector and if so in what manner? What kind of secretariat arrangements would be necessary in order to provide the association/council with the required substantive support and avoid creating a new bureaucracy, while entailing minimal additional cost? And most important, more extensive and detailed consultations with the donor community in general and important funding bodies in particular would be required before such an association/council could be organized and established. Such consultations, to be fruitful, should take place on the basis of concrete proposals formulated by the Commission and endorsed by the General Assembly.

Such a structure would answer several needs simultaneously: the need for flexibility without losing specificity; for secretariat support without creating a new bureaucracy; for sharper programmatic focus within the rubric

of science and technology; for a politically balanced framework within which member organizations could further these mandates and donor countries could contribute; for aid coordination that would include donor-recipient and issue-based coordination; and finally the need for connecting endogenous capacity-building with sustainable development.

The Commission may wish to review the alternative models presented for constructing a coalition of resources for science and technology, bearing in mind the intent of Member States as incorporated in General Assembly resolutions; to make necessary adjustments and innovations in order to respond to the emerging needs of developing countries; and to formulate concrete proposals for consideration by the General Assembly. It may also wish to provide substantive guidance for the work of the Secretariat on this subject.

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I. INTRODUCTION

A. Background

1. The General Assembly in resolution 44/14 D, reaffirmed the need for adequate resources on a continuous and assured basis to foster science and technology for development in accordance with the priorities of developing countries and requested the Secretary-General to explore the possibility of organizing a more effective coalition of resources. The former Intergovernmental Committee on Science and Technology for Development considered the question at its eleventh session, in 1991, and requested the Secretary-General to submit to it, at its twelfth session, proposals for action on how to organize such a coalition, prepared in close cooperation with the donor community, including the regional development banks and organizations of the United Nations system, especially the World Bank and the United Nations Development Programme (UNDP). The Assembly endorsed the request in resolution 46/165 and requested the Intergovernmental Committee, or possible successor arrangements, to submit to the Assembly at its forty-eighth session concrete proposals for organizing a more effective coalition of resources to meet the scientific and technological needs of developing countries.

2. The present report has been prepared in response to those requests, in consultation with the Administrative Committee on Coordination Task Force on Science and Technology for Development at its thirteenth session. In considering this report, it is important to bear in mind a few salient features. First, the international political and economic situation in the last two or three years has changed considerably, which will have a profound bearing on establishing and operating new financing modalities. The full implications of organizing a coalition of resources for science and technology at the current juncture need to be carefully reviewed, taking fully into account the fact that the exercise in question is at once an economic and a political undertaking.

3. Second, careful note should be taken of the outcome of the United Nations Conference on Environment and Development (UNCED), especially the science and technology related recommendations of Agenda 21 (A/CONF.151/26/Rev.1 (Vol. I)) and those concerning financing. 1/ Third, it is essential that the right lessons should be learned from the efforts made in the 1980s to create a self-sustaining financial system for science and technology before establishing or even conceiving a new modality. The basic fact remains that while there is a broad consensus that the science and technology needs of developing countries must be globally supported, there are deep differences among Member States on what means are to be employed to arrange and accomplish such support. Some would like it to take the form of a large, identifiable and distinct entity, while others, principally the industrialized countries, would prefer support to be diffused and sustained by existing organizations. Although the idea of a coalition is designed to be a compromise, it is still giving rise to different interpretations and hypotheses. To give flesh and blood to this concept will require substantial work, spanning a wide intellectual and political area.

4. In preparing the present report, the Secretariat took as a starting-point and frame of reference the proposals and concepts contained in the report of the Secretary-General on Financing Science and Technology for Development

(A/CN.11/1991/3), which was considered by the former Intergovernmental Committee on Science and Technology for Development at its eleventh session. The views expressed by Member States during the discussion on this topic were also considered. The mandate given to the Secretary-General by the General Assembly was not to debate the need for a coalition of resources - in several ways it already exists - but to make proposals on how to organize a more effective coalition and impart momentum to the process of building the endogenous scientific and technological capacities of developing countries.

5. Unlike a financing system or a fund, a coalition cannot be created and certainly cannot be sustained unless the important funding bodies and major donor countries are persuaded to join and participate in its operations, which requires extensive consultations and interfacing with donor agencies and countries. The Secretariat approached this task in several formal and informal ways, including presenting the subject for consideration by the Administrative Committee on Coordination Task Force on Science and Technology for Development. The topic was also discussed by the former Advisory Committee on Science and Technology for Development and at a meeting convened jointly by the United Nations and the Swedish Agency for Research Cooperation with Developing Countries, held at Tallberg, Sweden in June 1991.

6. The United Nations Secretariat also consulted with important funding agencies such as the World Bank, the Inter-American Development Bank, the African Development Bank and the Asian Development Bank. Consultations were tentative in nature and not based on any specific plan. More substantive consultations will take place after the Commission has had a chance to discuss this issue and provide guidance and guidelines for its consideration. The Commission may also wish to provide some guidance on how best to interface with the donor community and to identify the means through which it wishes to consider the matter in the inter-sessional period following the present session.

B. Recent developments

7. Since the adoption of General Assembly resolutions 44/14 and 46/165, several important developments have occurred that need to be taken into account, the most important of which was the United Nations Conference on Environment and Development. Future international efforts in science and technology will have to take into account the science and technology related provisions of Agenda 21. At the substantive level, the concept of home-grown capacity (that is, the capacity to manage technological change, including the ability to make informed choices; to monitor, assess and foresee technological developments; and to adapt and assimilate knowledge into the productive system) is fully in consonance with the pursuit of sustainable development. General Assembly resolution 44/228, inter alia, requested the Conference to consider various funding mechanisms, including voluntary ones, and to examine the possibility of a special international fund with a view to ensuring, on a favourable basis, the most effective and expeditious transfer of environmentally sound technologies to developing countries.

8. UNCED agreed that funding for Agenda 21 and other outcomes should be provided from sources and in a manner that maximizes the availability of new and additional resources and makes use of all available funding sources and

mechanisms. It did not, however, agree on any separate funding mechanisms for environmentally sound technologies, and the needs of developing countries in this regard, as in other areas, are expected to be met through the sources identified for financing Agenda 21 as a whole.

9. This makes the current exercise both more complex and more challenging. If the UNCED participants, in spite of intense high-level negotiations, could not agree on the need for financing modalities for access to and generation of technologies that are environmentally sound, what is the likelihood of creating a new mechanism for science and technology per se?

10. It is critical that the issue of a coalition of resources for science and technology be addressed in conjunction with the various initiatives in related fields, particularly in the fields of technology, development financing and the environment. The consideration of the issue of development financing at the forty-eighth session of the General Assembly may provide useful guidelines for pursuing a coalition of resources for science and technology and related issues.

II. FINANCING SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

A. Overview

11. The International Development Strategy for the Fourth United Nations Development Decade, adopted by the General Assembly in resolution 45/199, constitutes a major policy framework and frame of reference for elucidation and implementation in the different development domains in the 1990s. It attached considerable importance to science and technology. Inter alia, it stated that:

> "The reactivation of development in the decade of the 1990s on a sustained basis will be linked to the ability of developing countries to participate in the rapid advances in science and technology that have characterized the global economy in recent years and will continue in the future. Knowledge is today a crucial determinant of economic progress. The knowledge gap between developed and developing countries has been widening, and policies and measures are needed to help narrow it over the coming decade. High priority must therefore be given by the developing countries to raising their endogenous capacities and capabilities in this area (para. 56).
>
> "...
>
> "Building the scientific and technological capability of developing countries calls for external assistance in research and development, in the establishment and strengthening of institutions in the area of science and technology, in the diffusion of new technologies and in the training of scientific cadres" (para. 59).

12. How to finance development needs has been and continues to be a major issue on the international agenda. In this respect, there is a qualitative difference between the situation prevailing in the 1980s and the one that confronts policy makers in the 1990s. During the 1980s the focus was overwhelmingly on the investment needs of the developing world, which during the 1990s also includes

the needs of economies in transition. In addition, there is a growing demand for savings and capital in the developed countries to finance their domestic infrastructure needs as well as to enhance their productivity and competitiveness. As a result, investment capital, particularly of the concessionary kind, has become more scarce. Financing development needs of developing countries, especially through external sources, has become more complex as a result of these and other factors.

13. The increase in global awareness that economic processes should be sensitive to environmental and ecological concerns has introduced another new dimension to development. UNCED has introduced a new sensitivity to global concerns, centred around economy, environment and equity.

14. It is in this setting that the topic of financing the scientific and technologic needs of developing countries has to be reviewed. The agreement to establish a long-term, self-sustaining financing system for science and technology, reached at the United Nations Conference on Science and Technology for Development held in 1979, was itself a result of a political compromise between the developed and developing countries. Some of the major donor countries went along with that compromise. Nevertheless, they maintained reservations on the need for specific modalities to finance science and technology in the developing countries. A major cause of disappointment, to both developing and developed countries, has been the unsuccessful intergovernmental negotiations, spread over a decade, to establish the financing system for the implementation of the Vienna Programme of Action for Science and Technology for Development (A/CONF.81/16 and corrigenda, chap. VII).

15. Several studies have been conducted, over the years, to determine exactly how much is spent on science and technology at the national and international levels, and with what impact. As stated in the report of the former Advisory Committee on Science and Technology for Development on its eighth session (A/CN.11/91), data (especially time series of data) on expenditures on science and technology in developing countries are difficult to obtain and once obtained are very difficult to use for the purposes of international comparisons. Barring a few countries, such as China, India and the newly industrialized countries, most developing countries have been unable to harness even 1 per cent of their gross national product (GNP) for science and technology. In global terms, the share of developing countries in research and development expenditure is less than 10 per cent and even that is concentrated in a few countries. The economic hardship experienced by most developing countries in the 1980s, especially the low-income countries in Africa, has further eroded their resource base for science and technology. On the other hand, most industrialized countries have consistently maintained an allocation of over 2 per cent of GNP, while in per capita terms the gap between the developed and developing countries is even more pronounced.

16. Although, in percentage terms, external funding of science and technology is relatively modest in most countries (less than 10 per cent), it is still a crucial factor as a catalyst and multiplier, especially for the least developed countries. When assessing the volume of that external funding, however, problems are encountered similar to those encountered when assessing domestic resources. One study conducted for the former Advisory Committee on Science and Technology for Development estimated that in 1989 the flow of financial

resources into developing countries for science and technology, more precisely for research and development, was US$ 2.4 billion, more than half of which was devoted to agriculture and rural development. As regards endogenous capacity-building, the former Advisory Committee on Science and Technology for Development has stated that the development of endogenous capacity in science and technology has not yet become a major issue on the policy agendas of donor agencies and there remain a long series of unanswered questions about the flows (A/CN.11/91, para. 73). Earlier attempts to augment the flow of resources into science and technology were also somewhat handicapped, since they did not include mechanisms for innovating and adjusting to rapidly changing economic and political conditions, new market-based approaches, development financing and a lack of interaction with the private sector.

B. External resources

17. Precise estimates of world-wide expenditure on science and technology are unavailable, partly because the boundaries between science and technology are not clearly defined: the numbers vary depending on the activities included under either category and the keywords used in search and selection. External resources are channelled both bilaterally and multilaterally. Since most aid is of a scientific or technological nature (although largely in the form of implicit inputs), it is difficult to segregate scientific and technological aid from official development aid and multilateral resources. The World Bank estimates that in the 1980s it spent over US$ 5 billion on science and technology, embracing three main categories: higher education; technology and industry; and infrastructure and energy. Similarly, regional development banks, such as the Inter-American Development Bank, have traditionally been actively involved in lending large sums to their member States for science and technology related activities.

18. More accurate figures are available for expenditure on research and development and provide some idea of the overall science and technology picture. It is estimated that total research and development expenditures by countries that are members of the Organisation for Economic Cooperation and Development (OECD) was US$ 309 billion in 1991, as compared to a total of US$ 20 billion for all developing countries over the same period. Total bilateral and multilateral external aid for research and development in all developing countries was estimated at US$ 2.0 billion in 1991. These figures should be viewed in the context of official development assistance expenditures by all donors of US$ 53 billion in 1991. 2/

19. The impact of these expenditures on endogenous capacity-building is hard to assess, due to the complexity of the concept of endogenous capacity-building and the difficulty of relating it to across-the-board operational activities centred around sectors. Traditionally, operational activities of the United Nations system have been involved in the transfer of technology to developing countries through: (a) policy studies and advisory services; (b) North-South negotiations on transfer of technology; and (c) financing and managing technology transfers as elements in individual technical cooperation projects. The focus on capacity-building is of relatively recent origin and activities have not been targeted on such complex and long-term processes. For example, a study conducted on the efficiency of the United Nations system in science and

technology in the early 1980s came to the conclusion that less than 15 per cent of expenditure on science and technology by the United Nations system impacted on endogenous capacity-building. 3/ Such figures are indicative of the overall situation and reinforce the need for conceiving a new means of financing capacity-building for science and technology activities. An explicit mechanism for capacity-building could have a multiplier effect, attracting greater international attention and inducing Governments to channel larger resources and provide incentives for private sector participation.

20. Organizing a coalition of resources would call for close cooperation with multilateral funding bodies. In that context, the role of development banks, especially the World Bank and regional development banks, such as the Inter-American, African and Asian Development Banks, becomes critical.

21. World Bank activities in science and technology can be generally divided into two categories: support for activities specifically geared to technological development and technological elements of loans and credits for productive activities. The first category comprises such activities as the financing of research, networks like the Consultative Group for International Agricultural Research (CGIAR), the Tropical Diseases Research programme and specific project loans for science and technology to countries like the Republic of Korea, Brazil and Mexico. The second category of activities of the Bank does not have the specificity of the first category but may have a more extensive impact on technological direction and development. These activities are embedded and implicit in the full range of World Bank activities and in its project cycle, from project conception through formulation and appraisal to evaluation, including sectoral development strategies and reviews of country economic situations.

22. The importance and impact of technological elements in the World Bank operations vary from sector to sector and from project to project. Some are more technology sensitive and intensive than others. Underlying all these activities is the crucial issue of technological choice, that is, the relevance of a given technology to a country's resources, needs and capabilities. While the primary aim should be to fulfil project objectives, attention should also be paid to the nature and character of the technology inherent in the project and how that technology impacts on the achievement of national socio-economic goals and endogenous capacity-building. The tendency to opt for well-tested technologies conforming to international and implicitly external standards needs to be tempered with the long-term imperative for innovation and the ability of domestic capacity to generate and adapt its own technologies and integrate them into the productive system. The right technological choice needs to be made at the earliest possible preparatory phase and sustained through the entire project cycle.

23. The Bank, although not explicitly recognized as a technological institution, has an important role to play in managing global technological change and supporting endogenous capacity-building. It has the unique ability, lacking in many countries, to translate policies into investment projects and establish linkages between the technological and productive systems.

24. This applies equally to the regional development banks, whose activities and mandates are similar, at the regional level, to those of the World Bank.

Facilitating an enhanced and more focused injection of endogenous capacity-building in science and technology into regional project cycles and ensuring regional participation in an organized coalition of resources are both critical to the success of a more targeted international approach. It is a policy issue and at times involves a trade-off between technological capacities and getting a project on stream. Implicit in such trade-offs are important issues, such as the design of projects that favour indigenous versus foreign technologies; support for the building of local technological capabilities; international competitive bidding to encourage local suppliers; the impact of liberal trade policies; and, the process of project preparation itself.

25. The role of the World Bank and regional development banks in endogenous capacity-building in science and technology can, in sum, be twofold: actively participating in the proposed coalition, in its concretization as well as in its functioning; and injecting this dimension, analogous to environment, into their project cycles and strengthening their in-house capacities.

C. Experience of the 1980s

26. Before attempting to delineate the contours and content of a new mechanism, it may be useful to make a candid review of the experience of the 1980s and the lessons to be learned for the future.

27. Efforts to organize a coalition of resources in the 1980s were crippled by the absence of the required degree of political support, especially in the donor community. The resources that developing countries were able to mobilize among themselves could not reach and are still not likely to reach the commonly accepted "critical mass" level. In particular, the following aspects need to be underscored:

(a) The donor community, especially some major countries, do not consider that the only way to support and finance science and technology is through the establishment of a large and distinct financing system or fund; they would prefer that those needs be met through existing financing bodies;

(b) Some donors wish to retain control of how the funds channelled by them are used and prefer specific programmes and projects to across-the-board contributions;

(c) Many countries are reluctant to make contributions to small specialized funds and are more willing to contribute to other multilateral funding institutions;

(d) Donor countries also prefer that the resources channelled by them into various bilateral and multilateral funding bodies be better coordinated in support of clearly defined programmes;

(e) Ways and means will need to be devised to facilitate closer cooperation with the private sector, the business community and other potential investment resources.

D. Basic assumptions

28. The situation described above leads to the following assumptions:

(a) An implicit distinction needs to be drawn between financing science and technology, in general, and financing the process of creating and strengthening endogenous capacities for developing countries in science and technology, in particular;

(b) Any attempt to design a new modality should avoid the example of previous efforts in the 1980s, which established a separate financing system or a fund to which member States were expected to contribute;

(c) Any decision at the intergovernmental level in the United Nations to create a new financing or coordinating mechanism should be preceded by close consultations with the donor community, bilateral as well as multilateral, reflecting their concerns in the design and structure of such a mechanism;

(d) Domestic resources should be organically linked as a manifestation of the commitment of the recipient country, as well as a means of achieving greater efficiency in the use of the totality of global resources for development in a synergistic manner.

III. CONCEPT OF COALITION AND SURVEY OF SOME ALTERNATIVE MODELS

29. The general contours of the concept of coalition are contained in resolutions adopted by the former Intergovernmental Committee on Science and Technology for Development and by the General Assembly at its forty-fourth and forty-sixth sessions. It is, in its most basic sense, a means through which resources can be pooled from like-minded donors, who are united in a spirit of partnership to achieve a common goal through collective efforts, while at the same time retaining some measure of control or influence on how and for what specific activity such resources are used. The key words in General Assembly resolutions 44/14 and 46/165 are "organize" and "more effective". The task is not simply to assemble a coalition but to organize and structure it in a manner that makes it more effective than current modalities in achieving its objective.

A. Basic principles

30. It may be useful to formulate some basic principles that could govern the concept of coalition and its mode of functioning:

(a) The coalition should be based on concrete programmes in a manner that makes it attractive for potential donors to participate, in line with their own perceptions and priorities;

(b) The focus should be primarily on coordination and policy coherence, not the establishment of a new fund and/or a new bureaucracy;

(c) The emphasis should be on qualitative additionality, not merely "quantitative additionality" to any substantial degree;

(d) The programmatic coverage must be more sharply and clearly defined, and centred around the concept of endogenous capacity-building;

(e) Priority needs to be given to programmes derived from a process of consultations and dialogues among the various stakeholders in the development process, so that science and technology priorities command the broadest societal consensus;

(f) The coalition should, within broad and commonly agreed criteria, provide for maximum flexibility and diversity in the approaches of participating organizations, in accordance with their own mandates and policies and the different economic and social conditions of their constituencies.

B. Alternative models

31. The task of constructing a coalition for science and technology has to be addressed bearing in mind the above parameters. Basically, two scenarios can be envisaged: (a) an inter-institutional modality for information exchange and policy coherence; and (b) a financing mechanism that is loosely structured but very different from a financing system or a traditional fund.

32. The first paradigm closely parallels the Committee of International Environmental Development Institutions and would involve, inter alia, sponsorship by a core group of donors, a declaration of intent subscribed to by the development financing community and annual meetings at which each member/agency would report through a common format on its activities in implementing the declaration and on inter-institutional cooperation.

33. Such a mechanism would serve to:

(a) Introduce procedures for the systematic examination of development activities by member organizations in endogenous capacity-building;

(b) Promote cooperation to ensure that necessary changes were made in the design and direction of technical assistance to developing countries so that these directly contributed to endogenous capacity-building activities undertaken by the United Nations Secretariat;

(c) Develop in-house capacities in the organizations concerned for technology assessment and for appraising their own impact on endogenous capacity-building;

(d) Assist developing countries, at their request, to introduce policies and programmes critical to endogenous capacity-building.

34. The mechanism would be designed to help participating organizations arrive at a set of agreed priorities and objectives, which could in turn provide a framework for more specific activities in a multilateral context, either bilaterally or directly between groups of donors.

35. While it is important to recognize what such a mechanism would accomplish, it is equally necessary to realize what it would not accomplish. In sum, such a

mechanism would raise consciousness among participating entities, provide a forum for the exchange of information and facilitate greater substantive cooperation among the signatories. It would not fund any programmes or projects and member organizations would not be required to pledge resources into any common pool.

36. A comparable mechanism is the Latin American Association of Development Financing Institutions. Founded in 1968, it is an organization that represents the Latin American development banking community. It channels resources of institutions within and outside the region to benefit the development financing institutions of Latin America; promotes cooperation and exchanges between markets; facilitates studies on problems of common interest; and brings together markets to increase their contributions to Latin American integration and improve their individual and collective actions. Its structure consists of a general assembly, an executive board and a secretariat. Similar associations exist in the Africa and Asia and Pacific regions, such as the Association of African Development Finance Institutions and the Association of Development Financing Institutions in Asia and the Pacific.

37. The second alternative, admittedly more difficult in present financial circumstances but more in tune with General Assembly resolutions 44/14 and 46/165, would be to design a financing mechanism through an organized coalition that would, attract voluntary contributions from like-minded bilateral and multilateral donors, united in their commitment to finance and support the process of endogenous capacity-building in developing countries. It needs to be emphasized that, to achieve any measure of success, such a mechanism would have to be conceived and constructed in a manner very different from the design of an orthodox financing institution, such as International Development Association or the International Fund for Agricultural Development or even a large voluntary fund modelled after UNDP or the United Nations Population Fund. Resources would need to be contributed for at least two or three years: capacity-building is a long-term process and requires the assurance of long-term commitments.

38. At this juncture, it may be useful to review briefly the experience of one of the successful multilateral funding mechanisms: the Consultative Group for International Agricultural Research (CGIAR). It provides a good example of how to generate donor support and commitment to achieve a global goal: research and training to enhance the quantity and quality of food production in developing countries. Established in 1971 with the support of nine donors, its level of funding increased from US$ 15 million in 1971 to over US$ 300 million in 1991. The number of donors increased to 23 in 1975 and subsequently to the current 40. It is now a multifaceted system, encompassing co-sponsors, donors, non-donor representatives of developing countries and international agricultural research centres. All members of the OECD Development Assistance Committee, other than New Zealand, are CGIAR donors, providing almost 75 per cent of the system's resources, while multilateral institutions contribute over 20 per cent and developing countries and international foundations contribute 1 per cent each. The World Bank, the Food and Agriculture Organization of the United Nations (FAO) and UNDP are co-sponsors, and the regional development banks for Africa, Asia and Latin America are members. The World Bank provides CGIAR with a chairman and executive secretariat, both based in Washington, D.C. and the Group is advised by a panel of experts, the Technical Advisory Committee, whose

secretariat is provided by FAO. The number of centres supported by CGIAR has grown from 4 to 16.

39. A somewhat modified alternative approach would be to focus exclusively on country-level coordination, following the example of the pilot programme on endogenous capacity-building currently being implemented by the United Nations in six developing countries. This programme is designed to assist countries concerned in building and strengthening their endogenous science and technology capacities through a country-driven consensus process. An important element of the programme is to harness a coalition of resources, at the country level, drawn from diverse external and domestic sources, in order to implement the portfolio of projects that are identified and initiate policy dialogues among a broad range of stakeholders/constituencies in the development process. This pilot programme has been well received by the donor community, including OECD, and could mark a point of departure in assembling a consortium of funds from like-minded donors united in their desire to assist specific countries in science and technology.

40. In constructing and organizing a new international association/council for science and technology, the establishment, preparatory actions and growth of CGIAR, could provide valuable pointers.

IV. PROPOSALS FOR ACTION

41. The following paragraphs present a number of proposals conceived in the framework of the second alternative (see paras. 32 and 38 above).

A. Structure

42. Any organized coalition of resources, to be effective in collecting, coordinating and funding country-level activities, should assume an appropriate organizational identity. In the present case, it could take the form of an association or a council with a broad-based membership, including multilateral funding bodies, such as the World Bank and the regional development banks; Member States; autonomous publicly funded institutions, such as the Canadian International Development Agency; the International Development Research Centre, the Swedish International Development Authority, the Swedish Agency for Research Cooperation with Developing Countries and the United States Agency for International Development; and international foundations. The association/council, the general body, could meet once every two years to enable members/participants to contribute resources, to monitor and review work, provide policy guidance and priorities and elect members to the executive board.

43. An executive board could be established to oversee and monitor the work of the association/council, allocate resources and approve projects. The board should have balanced representation from donor countries, donor organizations and developing countries.

44. A secretariat to service the work of the association/council, especially the work of the executive board, could be provided jointly by the United Nations Secretariat and UNDP/UNFSTD. The task of the secretariat would be: (a) to

receive project proposals from developing countries; (b) to help in their formulation where necessary; (c) to appraise projects from the perspective of endogenous capacity-building; (d) to undertake periodic evaluations; and (e) to perform such other functions as were assigned to it by the board.

B. Functions and mode of operation

45. The association/council would make resources available as grants, to be used to fund only those activities whose primary objectives were directly and demonstrably centred around endogenous capacity-building. The association/council would formulate appropriate guidelines in this respect. Members/participants would have the choice to decide which of the projects they would like to fund and in what manner. Co-financing would be another mechanism through which donors might combine some of their current endogenous capacity-building resources with financing from the association/council and direct such resources to support specific endogenous capacity-building programmes. Its mode of functioning would also enable multilateral/bilateral coordination.

46. Another distinctive feature would be a deliberate policy of harnessing domestic resources to the extent possible, in a spirit of partnership. Such an organic linkage would serve several purposes. It would induce a sense of commitment from the recipient country and enhance the probability that the project would achieve the status of a high national priority, worthy of being allocated scarce domestic and foreign resources. It would also answer the often expressed concern that externally aided development projects are largely donor-driven. However, since the dynamics that drive domestic funding and external aid are different, it would not be easy to bring about such an integration. The precise modalities would need to be worked out, bearing in mind the wide economic disparities among developing countries. Special considerations should guide funding the needs of the least developed countries, for which even a token domestic funding (roughly 5 per cent) would be desirable, if only to give the sense that they were partners in a project and not merely recipients. The possibility of contributions in kind should also be explored.

47. Endogenous capacity-building in science and technology must by definition be country-driven, and national execution is neither an adjunct nor a means of delivery but is an integral part of the project. In this spirit, domestic resources and skills should be drawn on to the fullest extent possible. The use of external inputs and expertise should be a last resort only and should be initiated on the basis of a joint determination by the project management and the country concerned.

48. A programme or portfolio approach, encompassing a range of interconnected activities, should be adopted. The process of prioritization and formulation of programmes would also be unique. There is a growing awareness that choosing science and technology priorities is a most complex and intricate task and that, to be enduring, the full spectrum of stakeholders in the development process must be involved. That suggests the need to stimulate domestic consensus-building, a form of participatory priority setting, through a series of policy dialogues. Such dialogues, adjusted to the specificity of each country, are expected to produce scientific and technological programmes derived from technology-sensitive development domains.

49. The association/council, the organized coalition of resources, although not altogether excluding other programmes, should give high priority to supporting programmes that arise from such a domestic consultative consensus-building process. Countries that seek assistance from the association/council should be requested to describe not only the content of the project but also how the proposals are formulated, which should be a major factor in deliberations by the executive board in approving projects.

50. The secretariat of the association/council would be provided jointly by the United Nations Secretariat and UNFSTD/UNDP. The United Nations share of the relating costs would be met from within the existing resources approved under section 39 of the United Nations programme budget. The executive board would establish detailed criteria/guidelines for appraisal, in order to ensure that the primary focus of programmes approved was endogenous capacity-building and generic science and technology. Such guidelines could also be adopted by donor organizations, in order to make their work in science and technology more focused and targeted on capacity-building.

51. There is a growing awareness on the part of development banks that they must broaden their criteria/guidelines to include social as well as economic impact. Equally imperative, in today's knowledge-intensive techno-economic paradigm, is the injection of the technological impact into the project cycle, from design through formulation to appraisal and evaluation. The association/council must be in the vanguard of the effort to raise the level of consciousness of the donor community in these respect.

52. The association/council would have to ensure that the programmes that it supported were in full harmony with sustainable development and that they did not further endanger the global ecological balance. Sound technological choices, a critical component of endogenous capacity-building, implies and requires that they be environmentally sound, otherwise the choice itself is faulty and unsustainable. The executive board, in determining the criteria for appraisal and evaluation, would have to pay particular attention to this question. In doing so, it would also be contributing to the achievement of one of the objectives of UNCED - namely, to examine the possibility of a special international fund and other innovative approaches for establishing environmentally sound technologies. The emphasis, however, would be on building endogenous capacities for managing technological change in the direction of environmentally sound technologies, rather than merely providing access to and transferring such technologies.

Notes

1/ A compendium of excerpts on science and technology related issues and recommendations of Agenda 21 is being made available to the Commission in a separate document.

2/ See note by the Secretary-General on the comprehensive policy review of operational activities of the United Nations system (A/47/419/Add.1) and General Assembly resolution 47/199.

Notes (continued)

3/ See report of the Secretary-General on the study of the efficiency of the United Nations system in the field of science and technology for development (A/36/240).